CONDUCT AND ABILITY

A Text-book of Psychology from the Hormic and Noegenetic Standpoints, with Practical Exercises for Students

by

FRANCES BANKS, M A

PRINCIPAL OF THE GRAHAMSTOWN TRAINING COLLEGE, SOUTH AFRICA

With 55 Diagrams



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TO

STUDENTS

OF

G T C

PREFACE

THE writing of this text-book of psychology has been largely actuated by the need experienced, over many years of teacher-training, for a practical and comprehensive text-book adapted to the concrete problems of education, and based upon a sound theoretical foundation, such as is presented by the hormic and analytic views of conduct, and the, until recently, less accessible factor theory of ability and noegenetic doctrine of cognition

It is hoped also that this book may be of use to teachers and others who feel the need for a simple conspectus of present-day educational psychology

For the sake of such readers the practical exercises are placed at the end of the book instead of being interpolated between the chapters, but actually Part III is meant to be used by the student concurrently with Parts I and II

The book may be criticized for its wide use of quotation, which has made it somewhat lengthier than it would otherwise have been The aim of this has been to point the general reader and the student to the works of the experts, for such specimens of living style possess an allurement which text-book condensation can never reproduce. No student has really been introduced to the subject of psychology unless he has been inspired to read a few at least of the monographs of research

Such wealth of illustration has only been made possible through the generosity of a long list of authors who, with their publishers, have most kindly given their consent to quotation, detailed acknowledgment is gratefully made in

the text and in the bibliography Thanks are especially due to Professor McDougall and Professor Spearman, not only for permission to draw so freely upon their works for this combined presentation of their doctrines, but also for their very kind help in reading and criticizing the relevant sections of the MS

Gratitude must be expressed to Dr E H Wild for infecting the author with his own enthusiasm for noegenetic psychology and for his helpful perusal of the MS , also to him and to the other members of the staff of the psychology department of Rhodes University College for generously throwing open their library The writer has also to thank Dr Truda Brock for help in the physiological presentation in Chapter II

To Dr May Smith there is a further debt of gratitude, not only for her shrewd comments on the book in MS , but also for her first inspiring introduction to the subject of psychology

Thanks are due to Canon K E Kirk for an illuminating criticism of the last part of Appendix 2

Nor must thanks be omitted to those students who have allowed their work to be used in this book, and who have been the unwitting subjects of a sustained test on the comprehensibility of its contents

It is hoped that any want of clarity in the text may be made good by the diagrams, for many of which the writer is involved in a further debt to the authors and their publishers listed below

Lastly, thanks are due to those who have given untiring help with the preparation of the MS for publication, especially to Miss G Eirene Holmes M B E , and to Miss Lilian Banks B A

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CHAPTER I

INTRODUCTION

DEFINITION, SCOPE AND SUB DIVISIONS OF PSYCHOLOGY

DEFINITION —The word *psychology* is derived from two Greek words, *psyche* (mind) and *logos* (reason or study) It cannot, however, be defined as the *study of the mind*, since psychologists are not agreed about the definition of ' mind," or even about its existence Nor can psychology be defined as the *study of consciousness*, for that would exclude *unconscious* mental workings which are specially studied by a section of psychologists, nor yet can it be called the *study of behaviour*, since some psychologists use the word *behaviour* as referring only to outward actions, and not at all to the subject's inward mental experience

In the broadest sense psychology covers both the study of people s external behaviour, and of the conscious processes which go on in the mind of each person from moment to moment Moreover, this study rests upon *observation* which claims to be *scientific*, since it must be undertaken at first hand, and under standard conditions, and wherever possible it must use measurement *Incidental or casual observation* also has its value, and often suggests a line of investigation, but the aim must always be to supplant it by the more exact method

Therefore psychology may be comprehensively defined as The scientific study of human nature through the observation of objective behaviour and subjective experience

Relation of psychology to physiology and philosophy —The study of psychology must therefore make demands upon *physiological science* and upon the newer study of *biochemistry* for its

understanding of the physical bases of behaviour, for it is one of the catchwords of psychology that there is no *psychosis without neurosis*, that is, that every mental event has its physical counterpart in the neural mechanism. Although adequate physical explanation is far beyond the present resources of science, it is right that the physiological basis should be taken into account to the full measure of its findings. This holds true also of the biochemical findings which have revealed some astonishing facts about the influence on the nervous system of secretions from the ductless glands.

Within this generation psychology has attempted a complete break away from *philosophy* of which it was wont to constitute a sub-section in academic curricula. Yet no one can study psychology and remain indifferent to the philosophical implications with which it bristles, and, as every psychologist is also a human being concerned in a complete life of work, leisure and personal belief, he is likely to carry over into his psychology an overplus from his personal philosophy. To light up the dangers arising from such bias, and to indicate the scope of these philosophical implications, a brief summary of the time-honoured contending doctrines of the relation between body and mind is given in Appendix 2.

AIM, SCOPE AND KINDS OF PSYCHOLOGY

The past century has seen an enormous development in the understanding and control of physical forces. It is the opinion of some of the greatest thinkers of the day that the human mind has over reached itself in this direction and is likely to be mastered by the machines which it has created, or to be swept aside in the vast economic repercussions thus unwittingly set in motion. World affairs seem to be assuming a rapidity and complexity beyond man's intellectual capacity to comprehend or control. For many thinkers the only hope would seem to lie in a more penetrating understanding and direction of human mentality in order that co-operation on a scale before unknown may ensure the constructive, affirmative use of forces of such immense destructive potency. A well known psychologist has defined the aim of psychology as "to render our knowledge of human

nature more exact and more sympathetic, in order that we may control ourselves more wisely and influence our fellow men more effectively "[1]

An immediate popular result of this world need has been an indiscriminating belief in the efficacy of psychology, a study still in its infancy and rent by conflicting theories *Pure* science, which pursues knowledge for its own sake, normally precedes *applied* science, which makes use of it as an aid to practical living, but in psychology, as in the medical sciences, human need has made an impatient impact upon pure investigation As a result, knowledge is developing very rapidly There is a host of research workers in the field, labouring to set up laboratory and clinical techniques by means of which much first hand empirical information is being acquired More gradually, a few constructive thinkers are endeavouring to classify and co-ordinate the facts, so that they may be understood, and their occurrence under certain conditions predicted

The *range* of psychological study is as wide as life

1 The *normal human adult* is its first concern

2 Complex objects are often best understood by studying easy examples which may supply clues Accordingly *comparative* studies have been made of *animal* behaviour, especially of the ways in which animals learn simple reactions, such as running through a maze to find food, or opening a cage, or using a tool to obtain it Mice, rats, cats, dogs and apes have been favourite subjects for psychological experiment

3 Such comparative studies also throw light upon how behaviour has developed from lower to higher forms of life and how adaptive reactions have progressed up the scale of evolution This is known as developmental or *genetic* psychology, and when it deals with racial development it is a *phylogenetic* study Another way of studying development is to observe the gradual unfolding of individual powers, from birth through all the stages up to adult life, this is an *ontogenetic* study Many psychologists, in Germany especially, have patiently observed human infants, and made important contributions to *child psychology* The present-day interest in education is adding to this knowledge in many directions

[1] *Outline of Psychology* McDougall p 1

4 Another branch of psychology studies the reactions of a group or society, and is known as *group* or *social* psychology Society is made up of individuals, yet it is possible to make a special study of the modifications which occur when individuals find themselves acting collectively, whether in an unorganized group such as a mob or crowd, or in an organized group such as a club, society, committee, trade union or legislative body

5 Lastly, psychological study spreads beyond the *normal* to the *abnormal* The term "normal" merely means that which is most numerous, and therefore nearest to the average. So far as intelligence and other capacities are concerned, there extends on one side of it the *supernormal*, comprising the specially gifted, with genius at the end of the scale, and on the other side, the *subnormal*, ranging from the slightly mentally defective to the idiot. Abnormality, however, suggests not so much a question of more or less, as a deviation away from the main line of development by a dislocation or exaggeration of some trait or process Even "normal" people commonly experience the bizarre thought processes which distinguish dreams from waking life There are also many pathological kinds of disturbance, some of which occur only temporarily or periodically, or affect only a part of the personality, for example —attacks of hysteria may befall otherwise normal people, a nerve disorder may be merely local like the facial twitch of St Vitus' Dance, and an *obsession* or *compulsion* may seem no more than a mild eccentricity, as when a man cannot pass a pin without picking it up or a dog without barking at it. Other disturbances may involve the main energies of the personality and make it incapable of normal life, whether temporarily or permanently

The term *general* psychology is applied to the psychology of the *normal, human, adult individual* *genetic, comparative, social* and *abnormal* studies form special branches of psychology In so far as these are undertaken from a disinterested, scientific standpoint, they represent different branches of *pure* psychology It will, however be obvious that they will be closely related to the *applied* studies which are their outcome

APPLIED PSYCHOLOGY

1 There is no more urgent call for the application of psychology than from the *medical* world. Already the old so-called *lunatic asylums* are in process of transformation into *mental hospitals* which differ from them no less in character than in name. The strait-jacket is almost a thing of the past; "madness" has ceased to be an all-embracing term for mental disorders; many forms, curable or as yet incurable, have already been diagnosed, and have been found to be exaggerations of the normal, upon which they throw back a new light. Sometimes the root of the trouble is physical, and diseased tissue calls for medical or surgical treatment. But some disorders show no signs of corresponding physical causes; they seem to be disturbances of function only, and may yield to a purely mental treatment by the psychiatrist or mental doctor, or by the psycho-analyst.[1] Other agencies, such as advance in knowledge of drugs, brain physiology and surgery, have helped to transform the treatment of mental disorders, but psychology is responsible for a large share in the new approach. Psycho-pathological study received a special impetus in the Great War when "shell shock" cases had to be treated in unprecedented numbers.

2 Some rudimentary application of psychology has been made in the legal or *juristic* sphere, notably in the psychology of evidence, which has thrown considerable light upon the problem of accurate witness.[2]

3 The *economic* world has availed itself of psychological research in three main respects. (1) Institutions such as the *National Institute of Industrial Psychology* in London, and the earlier *Industrial Fatigue Research Board*, have studied the fatigue effects of different tasks in various industries, and have found means of lessening them by better ways of arranging the machinery and conditions of work, by rest pauses, and by training new workers in the most economical movements. (2) Some successful attempts have been made to frame tests of vocational guidance for the sake both of the applicants and of the industry or profession; thus there are tests for weavers, engine-drivers, aviators and others. (3) The psychology of observation and

[1] See p. 11 below.

[2] See Experiment 13.

suggestion has been turned to account in the art of advertisement, to the advantage of the advertiser if not to the æsthetic en hancement of the public ways Along another line, many large industries, especially in America, have found the advantage of employing a psychologist for general welfare work among their employees

4 As might be expected, some of the most far reaching applications of psychology have been made in the realm of *education* If education can be defined as "the production of useful changes in human beings,' [1] and these changes are considered as comprising changes "in *knowledge*, in *skill*, and in *ideals*," [2] then educational psychology must take account of many factors It must consider the *inborn endowment* of the individual to be educated, the stages through which he must *develop*, the *social* factors which the school will bring to bear upon him, and the best ways of training sound personality The educator will be glad to know what may normally be expected of children of a given age, and how to detect departures from the average, hence he will make use of the new knowledge of *mental testing*, and of the *statistical* principles upon which it is based He will be much helped by recent discoveries about the *learning process*, which supply practical information about the best and quickest ways of understanding and of memorizing material and of acquiring facility in various subjects, especially in reading, writing and arithmetic

In short educational psychology, resting upon a basis of general psychology, may be regarded as comprising the two-fold study of conduct and of ability

5 Allied both to educational and to juristic psychology is the rapidly developing application of psychology to *delinquency* and criminality More account is being taken of the mental state of the criminal but the change of attitude is most marked in the work of the juvenile courts, where the aim has become reformative rather than punitive Some probation officers and other police-court workers have received psychological training, and the day may come when the same will be required of all magistrates and especially of the chairmen of juvenile courts There is a wide field for experimentation in the many attempts

[1] *Educational Psychology* Starch p 1 [2] Op cit.

being made to find the most satisfactory remedies for individual offenders and the best types of reformatory

SCHOOLS OF PSYCHOLOGY

With so many different branches of psychology it is not surprising that there should be many different schools of psychological thought, either at work in different spheres, or maintaining their theories in the same sphere These can only be briefly indicated at this stage to serve provisionally as a guide to reading

In the study of the normal processes of conduct and learning, two opposing views call for comment, namely, *Purposivism* and *Behaviourism* *The Hormic* or *Purposive School*, of which McDougall is the best known protagonist, believes in an essential element of drive or urge in all forms of mental activity Following Sir Percy Nunn, he proposes to give to this element of drive, 'whether it occurs in the conscious life of man and the higher animals, or in the unconscious activities of their bodies and the (presumably) unconscious behaviour of lower animals," the Greek name of *horme*, from which is derived the adjective *hormic*

For this school all activity is thus essentially *goal seeking* Starting from the position that there is more than physics and chemistry even in the humblest animal, it (the hormic theory) comes to view the history of life as a striving toward the individuality which is expressed most clearly and richly in man s conscious nature, and finds, therefore, in that goal toward which the whole creation moves the true interpretation of its earlier efforts ' [1]

Hence all learning and progressive adaptation is acquired in the service of certain inborn dynamic urges or *propensities* [2] Intelligence develops through conscious mental direction towards these ends Feelings of pleasure and pain serve to guide this striving, but they are not its motives Thus McDougall writes

> The instincts (*sic*) are the prime movers of all human activity, by the conative or impulsive force of some instinct, every train of thought, however cold and passionless it may

[1] *Education Its Data and First Principles* Nunn Quoted *Outline of Psychology* McDougall pp 72 73 *Social Psychology* McDougall pp 409-410 footnote *Psychologies of 1930* pp 34 35

[2] Formerly termed *instincts* by this school.

seem, is borne along toward its end, and every bodily activity is initiated and sustained The instinctive impulses determine the ends of all activities and supply the driving power by which all mental activities are sustained, and all the complex intellectual apparatus of the most highly developed mind is but the instrument by which these impulses seek their satisfactions, while pleasure and pain do but serve to guide them in their choice of the means Take away these instinctive dispositions, with their powerful impulses, and the organism would become incapable of activity of any kind, it would lie inert and motionless, like a wonderful clockwork whose mainspring had been removed or a steam-engine whose fires had been drawn '[1]

Perhaps McDougall's strongest claim to the acceptance of his doctrine is the way in which he has consistently applied it to one sphere of psychological study after another, thus building up a coherent presentation, which extends from the domain of speculative philosophy at one end to that of practical sociology at the other, and in another plane, from pure experimental investigation to psychiatrical practice As a medical doctor and neurologist he wrote an early handbook on physiological psychology[2] An account of the social adjustment of the individual[3] was followed later by studies of the social structure[4] and of national questions[5] A general outline,[6] which included a treatment of the intellectual processes, was followed by a work on abnormal processes,[7] summing up war experiences with shell-shock cases In several other works McDougall has sought to preserve a philosophical background and perspective [8] and over a term of years he has been concerned with the wide scientific problems of heredity[9] For students of

[1] *Outline of Psychology* McDougall p 218 cf *Social Psychology* p 38

[2] *Physiological Psychology* 1905 [3] *Social Psychology*, 1908

[4] *Group Mind* 1920

[5] Cf *National Welfare and National Decay*

[6] *An Outline of Psychology* 1923

[7] *An Outline of Abnormal Psychology* 1926

[8] Especially in *Body and Mind* 1911; cf also *Modern Materialism and Emergent Evolution* 1929 and *The Frontiers of Psychology* 1934.

[9] *Brit Jour Psych* Vol. XVII Pt. 4 April 1927 "An Experiment for the Testing of the Hypothesis of Lamarck *Brit Jour Psych*, Vol.

education the most convenient up-to-date summary of his works is to be found in *The Energies of Men* [1]

The Behaviourist School, of which Dr John B Watson was the pioneer, strongly opposes the hormic view because it considers that it introduces two factors which cannot be made the subjects of scientific treatment So the most thoroughgoing behaviourists wish to leave both *purpose* and *consciousness* out of account They will deal only with what can be tested by laboratory experiment

In Watson's own words

'We need nothing to explain behaviour but the ordinary laws of physics and chemistry '[2]

" The behaviourist cannot find consciousness in the test tube of his science " " The behaviourist finds himself in rather a peculiar situation to-day Denying mind, the philosophers will have nothing to do with him, denying consciousness and its subdivisions (sensations, perceptions, images, and the like) the psychologist will have nothing to do with him The further implication from all this, viz that there is no unconscious, no subconscious, no conscious, leads the psychoanalyst to have nothing to do with him ' [3]

Behaviourism claims that ' consciousness ' is neither a definable nor a usable concept, that it is merely another word for the soul ' of more ancient times ' [4]

This has led to investigation into the physiological bases of behaviour, the nervous system and the glands It has also led to some interesting experiments on the learning of animals and on the reaction capacities of new born infants

To turn to the affirmative side of the theory Watson believes that organisms respond to physical stimulations (technically known as *stimuli*) in prescribed ways and that they can be trained to react to appropriate stimuli in increasingly complicated ways Moreover, new stimuli become associated with the

XX Pt. 3 Jan 1930 Second Report on a Lamarckian Experiment *Brit Jour Psych* Vol XXIV, Pt 2 Oct 1933 " Third Report on a Lamarckian Experiment " (in conjunction with J B Rhine)

[1] 1932

[2] *Journal of Psychological Studies* Vol I Pt. 4 Oct. 19-6 Article Behaviourism a Psychology based on Reflex Action Watson

[3] Op cit [4] *Behaviourism* J B Watson, p 3

original stimuli and so become able to replace them The original response is then said to have become *conditioned* to this new stimulus To take an example the *unconditioned* response to a loud noise is a fear response if simultaneously with the presentation of the noise, a furry animal or object (e g rabbit, dog, lady s fur) be presented to the child, on a subsequent occasion the fear response may be given to this when the noise is not present, thus the response has been "conditioned" to the new stimulus In this way the child comes to fear the dog and not merely the bark

Such experiments received much encouragement from original work in Russia Pavlov, a physiologist working upon glandular activities, discovered the same phenomenon in the dog s salivary reflex He found that saliva would begin to flow at the first signals of food (e g the sight of the dish, the foot steps of the attendant) when these had previously accompanied it This reaction to a *substitute stimulus* he termed a *conditioned reflex* and he worked upon it until some dogs apparently responded to the correct tone of a tuning fork within a differentiation of less than a semitone[1]

There has probably set in an ebb of the first ardent faith in behaviourism as a solution of all problems of prediction and control of response a faith which was enhanced by the extreme environmentalism developed by Watson who claimed the possibility of training any human infant to any given profession, granted control of the conditions There are probably only a comparatively few adherents of the 'strict" Watsonian school

A word must be said about the use of the terms "behaviour' and behaviourism" The word 'behaviour' was previously used by the purposivists themselves to signify the dual fact of the subject s inner awareness of experience, and his outer behaviour or performance Watson, in his book *Behaviour An Introduction to Comparative Psychology*, 1914, adopted the word as excluding the study of consciousness, and including only the objective study of performance[2]

[1] Cf *Contemporary Schools of Psychology* Woodworth p 66.

[2] Cf the definition of psychology as the Science of Behaviour, by McDougall (1905), and by Pillsbury (1911)

Accordingly the student will be alive to the implications when he meets a psychology text book[1] which claims to be an entirely *objective* study, or one mainly devoted to physiological exposition, or one which lacks the old terminology, for the behaviourist has dropped from his scientific vocabulary all subjective terms such as sensation perception image, desire, purpose, and even thinking and emotion as they were subjectively defined "[2]

To the behaviourist the hormic psychology seems obscure and almost fantastical To the purposivist the behaviourist doctrine seems mechanical, purblind and inadequate

Between these two schools there are many sorts of ' middle of the road '[3] psychologists

When it comes to the side of psychology which deals especially with intelligence, mental learning, and the *knowing* rather than the *doing* processes, there are other leaders whose theories need not be considered until Part II is reached *Professor Spearman* has worked out a theory of intelligence and knowing, based upon mathematical evidence, which will be explained and used in Part II *Professor Wolfgang Kohler* and *Professor Kurt Koffka* have paid special attention to the way in which minds grasp the facts of experience as wholes, rather than as an assembly of part-elements, they are the leaders of the German school of *Gestalt* or *Form* psychology

In the fields of abnormal psychology there has arisen a school of *psycho-analysis* under the leadership of *Professor Sigmund Freud* There are other *analytic* schools which do not accept all Freud s teaching The main concern of all these schools has been with neurotic patients, but much of their teaching about the *unconscious* mind has been widely accepted and applied to normal people Their theories will be more fully explained before the study of special educational problems in conduct development is undertaken at the end of Part I

[1] One of Watson s most important expositions is *Psychology from the Standpoint of a Behaviourist* 1919

[2] *Behaviourism* Watson p 6

[3] See *Contemporary Schools of Psychology* Woodworth Ch VII Also *Psychologies of 19 5 and Psychologies of 1930* ed Carl Murchison

PART I

THE PSYCHOLOGY OF CONDUCT

CHAPTER II

THE NEURAL MECHANISM

THE Reaction Time experiment[1] makes it clear that a very simple anticipated reaction to a touch stimulus takes just over a tenth of a second, and rather longer if the stimulus is attended to instead of the response, and that this interval lengthens with the complexity of the choice of reaction required If the experiment could be carried further it would be found that a touch stimulus gives the quickest response, reaction to a sound stimulus is slower, and to a light stimulus slower still Can this irreducible time interval be accounted for physically by any explanation of what is going on within the organism? It is reckoned that nerve-current travels along most human nerve fibres at an average rate of 120 to 125 metres a second, and this would not fully account for the delay

An analysis of pressure reaction to a touch stimulus at once makes it plain that at least two factors are involved (1) the reception of a stimulus by a sense organ, in this case an organ in the skin, (2) a muscular reaction, in this case of hand and arm muscles Between these two it is obvious that there must be a third hidden, connecting factor

I First, then, there are a number of *receiving organs*, commonly known as sensory organs It is, however, customary

[1] Experiment 1 p 339 should be worked before studying this chapter

nowadays to follow the "behaviourists" in the non-committal use of the term *receptor organ* This does not mean that the mental experience of sensation is to be eliminated from the view of human activity maintained in this book, but it will be convenient to postpone discussion of it until cognition can be treated as a whole in Part II Meanwhile it is possible to consider the organs in their function of transmission, irrespectively of whether they are transmitting impulses through centres in the brain or through simpler short-circuit pathways in the spinal cord and mid brain

II Secondly, there are *the units of connexion*, namely, (*a*) the neurone (*b*) the synapse

III Thirdly, there are the mechanisms which carry out reactions, known as *effector organs*, these consist of (*a*) the muscles, (*b*) the glands

These three factors will be briefly dealt with in this order, as units of a system

Then will follow a survey of the *integrated structure and function of the nervous system*

I RECEPTORS

Physiologists classify receptor organs into three groups according to the location of the stimuli or energizing physical factors by which they are stimulated [1] The body may be regarded as a cylindrical cavity with an outer surface in contact with the environment, an inner visceral surface, and between these two a body wall of striped muscle attached to a skeletal framework. It may be stimulated from any of these three directions Receptors externally stimulated are termed *exteroceptors* those internally stimulated *interoceptors*, and those stimulated from within the body wall *proprioceptors* (from Latin *proper* own) Naturally these divisions correspond approximately with the position of the organ Hence receptors are classified thus

N B —The term *stimulus* must be reserved for a nerve excitant which lies *outside the nervous system itself* thus one thought is not the stimulus of another associated thought.

A EXTEROCEPTORS These are subdivided into

1 *Distance receptors* which are affected by stimuli from afar

Eye

Ear

Mucous membrane of nose, as stimulated through the outer nostrils

2 *Contact receptors*, i e the skin or cutaneous organs which include

receptors for touch and pressure

" " heat

" " cold

" " pain

B PROPRIOCEPTORS

1 *Kinæsthetic receptors* in muscles

" " tendons

" " joints

2 *Receptors for posture and equilibrium*, in the semicircular canals utricle and saccule of the inner ear

C INTEROCEPTORS

1 Taste buds in tongue and pharynx for sweet

" " " " sour

" " " " salt.

" " " " bitter

2 Mucous membrane of nose as stimulated through the inner nostrils

3 Visceral receptors There are indications that receptors exist in the digestive system for arousing sensations of hunger, thirst and nausea, and in the circulatory, respiratory and reproductive systems for the arousal of their characteristic sensations but little is as yet known of their mechanism

From the above list it will be seen that the old epithet of 'The five gateways of the soul' is no longer even numerically acceptable [1]

[1] Unless it is justified in the following manner No fact or theory has ever been discovered to shake the division—familiar from the dawn of psychological history—into five great classes (i e of sentience)

The proprioceptors are a very important modern discovery, the division of cutaneous receptors into four (sometimes listed as five), and the restriction of taste-buds to four functions, are also significant, while neurologists are probably on the threshold of further discoveries in regard to visceral receptors

For details of these organs a work on physiology must be consulted It is proposed to give only a brief survey of their structure and functions here

A. EXTEROCEPTORS

1 The highest and most complicated differentiations of structure have developed on the head end of the organism which, phylogenetically considered, was the foremost end in motion and had therefore to be most sensitized to danger signals and to food indicators As the capacity for distance reception increased, the organism was simultaneously extending, not merely its control over the physical environment and over lower forms of life, but also its means of intercommunication with fellow beings in the growing organizations of the family and the herd The distance receptors are the intellectual sense organs *par excellence*, for they carry our range of reception far beyond the bare requirements of primitive physical subsistence

The Eye—The structure of the eye has often been compared with that of a camera The lens receives and refracts light rays from the gap in the iris known as the *pupil*, through the fluid filled ball, to the sensitive plate or *retina*, the true receptor, which lines the back interior area of the sphere The retina is composed of a threefold layer of cells, the outer one of which has two different types of cells, known as *rods* and *cones* from their shapes The rods are sensitive only to degrees of bright ness, the ranges white—grey—black They are scattered through the retina, except that they are not represented at the *fovea* or yellow-spot, they are the only cells which function on the outer fringe of the retina so that only colourless or

these are of sight sound taste and smell together with a tactile class that has always been admitted to have a very mixed constitution. This last one is nowadays usually subdivided into pressure warmth cold pain kinæsthesis and certain less definite sentient experiences attributable to the viscera."—*Nature of Intelligence* Spearman pp 49-50

achromatic impressions are possible out of the corner of the eye The cones are sensitive to colour stimuli, one type being receptors of red-green impressions, the other of yellow-blue At the fovea both these types of cones are present, and immediately around it they occur intermingled with the rods, in the ring surrounding this central area the red-green cones drop out, and leave a combination of yellow blue cones and rods, in the outer ring, as already said, the cones only are represented.

The fovea is the central spot of clearest vision. The lenses must focus the light stimuli upon the corresponding areas in both eyes if a single image is to be obtained, otherwise a double image appears Focussing is brought about by the *convergence* and *conjugation* of the eyes by muscular adjustments, and the *accommodation* of the lenses whereby they adjust their curvature to the size and distance of the visual object

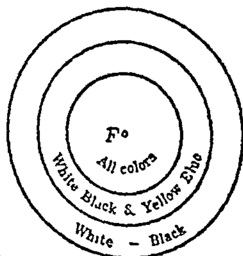


FIG 1—Colour zones at the retina. *F* is the *fovea* or central area of clearest vision.

Near the fovea is a *blind-spot* where the great optic nerve passes out to the brain, as a white cable of thousands of axone fibres, outgrowths of the retinal neurones, relaying nerve-impulses through the mid brain either to the upper cortical or lower reflex centres (Fig 2)

The Ear—The ear is a complicated structure consisting of three parts, the *outer*, *middle* and *inner* ear Vibrations in the atmosphere (regular for sounds and irregular for noises), produced by a sounding body, pass down the outer passage to the taut *drum*, the vibrations of which then set in motion the delicately poised ossicles (*malleus* or hammer, *incus* or anvil, *stapes* or stirrup) in the air filled cavity of the middle ear, the Eustachian tube, which leads from throat to middle ear, conducts this air and regulates its pressure (hence the uncomfort-

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For details of these organs a work on physiology must be consulted It is proposed to give only a brief survey of their structure and functions here.

A EXTEROCEPTORS

1 The highest and most complicated differentiations of structure have developed on the head end of the organism which, phylogenetically considered, was the foremost end in motion and had therefore to be most sensitized to danger signals and to food indicators As the capacity for distance reception increased, the organism was simultaneously extending, not merely its control over the physical environment and over lower forms of life, but also its means of intercommunication with fellow-beings in the growing organizations of the family and the herd The distance receptors are the intellectual sense organs *par excellence*, for they carry our range of reception far beyond the bare requirements of primitive physical subsistence

The Eye—The structure of the eye has often been compared with that of a camera The lens receives and refracts light rays from the gap in the iris known as the *pupil*, through the fluid filled ball, to the sensitive plate or *retina* the true receptor which lines the back interior area of the sphere The retina is composed of a threefold layer of cells, the outer one of which has two different types of cells, known as *rods* and *cones* from their shapes The rods are sensitive only to degrees of brightness, the ranges white—grey—black. They are scattered through the retina, except that they are not represented at the *fovea* or yellow-spot, they are the only cells which function on the outer fringe of the retina, so that only colourless or

these are of sight sound taste and smell together with a tactile class that has always been admitted to have a very mixed constitution This last one is nowadays usually subdivided into pressure warmth cold, pain kinæsthesis, and certain less definite sentient experiences attributable to the viscera."—*Nature of Intelligence* Spearman pp. 49-50

achromatic impressions are possible out of the corner of the eye The cones are sensitive to colour stimuli, one type being receptors of red-green impressions, the other of yellow blue At the fovea both these types of cones are present, and immediately around it they occur intermingled with the rods, in the ring surrounding this central area the red-green cones drop out, and leave a combination of yellow-blue cones and rods, in the outer ring, as already said, the cones only are represented

The fovea is the central spot of clearest vision The lenses must focus the light stimuli upon the corresponding areas in both eyes if a single image is to be obtained, otherwise a double image appears Focussing is brought about by the *convergence* and *conjugation* of the eyes by muscular adjustments, and the *accommodation* of the lenses whereby they adjust their curvature to the size and distance of the visual object

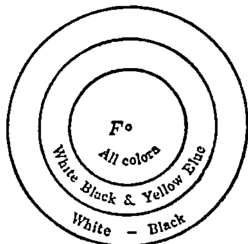


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gaseous particles which come into contact with them through inhalation

2 *Cutaneous receptors*

Patient work has been done on the skin by working over it with mounted horse-hairs, hot and cold metal-rods, and sharp

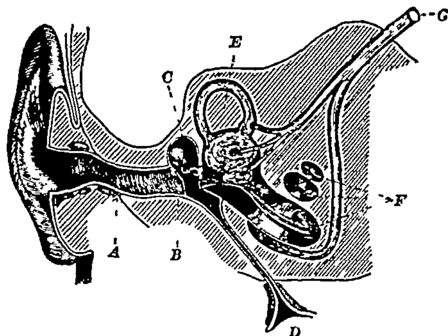


FIG 3—Diagram of the ear

A auditory canal of the external ear
B tympanic membrane separating the external from the middle ear *C*
D Eustachian tube leading from the middle ear to the throat.
E one of the semicircular canals of the internal ear, arising out of the utricle upon which as upon the adjacent saccule fibres from the vestibular branch of the eighth nerve are shown terminating
F, the spiral of the cochlea through the central pillar of which the auditory nerve is shown entering to spread out toward the hair cells of the cochlea canal
G the main trunk of the eighth nerve

(After Hough and Sedgwick)

points, which have indicated respectively the presence of *touch and pressure* spots, *warmth and* and *pain* spots, scattered in unequal numbers m over the whole surface ive to

aural disturbance produced by a cold in throat or nose) The stirrup oscillates against the *oval window* into the inner ear, and transmits vibrations through the fluid within to the actual auditory receptor cells in the basilar membrane contained within the bony spiral of the inner ear, known as the *cochlea* (snail)

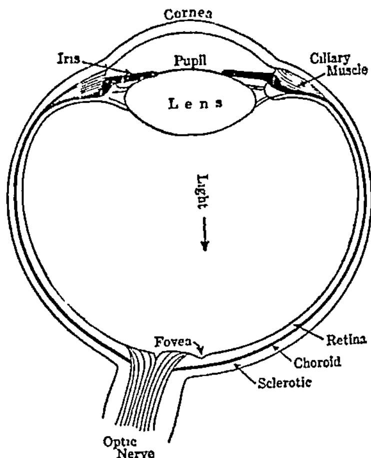


Fig 2 —Horizontal cross-section through the right eyeball

From thence the auditory nerve carries impulses along its thick cord of fibres to the mid brain centres for further relay

The Nose—The actual receptors are cells in the mucous membrane which covers a small area in an alcove off the respiratory passage at the back of the nose these are sensitive to

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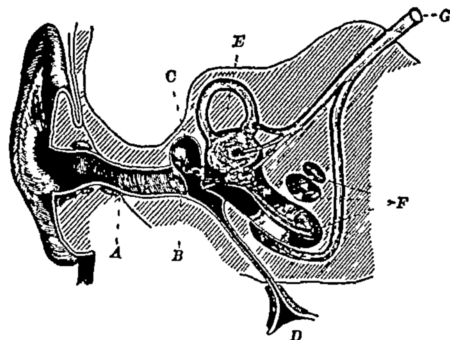


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points, which have indicated respectively the presence of *touch and pressure* spots *warmth and cold* spots, and *pain* spots, scattered in unequal numbers and irregular distribution over the whole surface of the body There are spots sensitive to

deep pressure, others sensitive only to light contact, whether through a nerve-ending situated at the root of a hair, or through another form of ending found in hairless areas The number of these touch-spots is estimated at about half a million, over and above those on the head Some areas, for example on the back, have a low distribution, others, such as lips and finger tips, are thickly endowed

Warmth spots are said to number about 30,000 They are sensitive only to temperature higher than that of the skin itself Cold spots number about half a million Both give their own

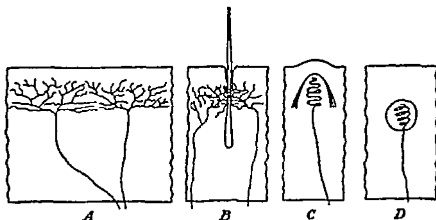


FIG 4.—Diagrammatic views of skin receptors
A the most common type of skin receptor present everywhere
B the hair receptor
C a touch corpuscle from the finger tip
D an end bulb from the mucous membrane.

paradoxical response to extreme stimulation of the opposite quality, which also actuates the pain spots

Pain spots are estimated at 2 to 4 millions in number Their end-organs are thought to be the free nerve-endings found in great numbers in the skin

It should be noted in passing that, unlike the other receptors dealt with above, the cutaneous receptors do not contain the nerve-cells of their neurones at the seat of stimulation, these, as will be more fully explained later, are bunched up in ganglia which run in strands alongside the spinal cord The receptors themselves are modified endings at the extremities of fibres

which are often of considerable length from the nuclei of their cells

Though the cutaneous receptors are classed as exteroceptors, their functions are not confined to external stimulation Thus touch and pressure may be aroused by muscular contractions by vascular pulsations and other bodily stimuli, and the thermal spots are aroused by internal bodily temperature as well as externally

B PROPRIOCEPTORS

1 *Kinæsthetic receptors*

The discovery of sensory nerve endings wound spirally around the muscle fibres, branched over the outer and inner surfaces of tendons and embedded in the membranes lining the joints, has thrown considerable light upon the processes of motor learning, as will be shown later The organs themselves resemble some of the sensory endings found in the skin, especially those concerned in deep pressure They are aroused, not only proprioceptively through muscle and tendon contraction and extension, and the bending of joints, but exteroceptively by the resistance of objects The organs work in close connexion with the cutaneous receptors The student must beware of attributing sensory functions to the muscles, tendons and joints themselves, their tissues have quite other functions, and it is only interpenetration by the specialized nerve-tissues of the afferent sensory organs which makes the reception of impulses from them possible

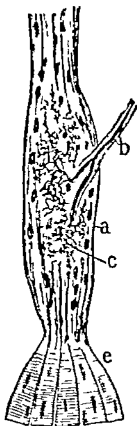


FIG 5—A tendon spindle *a* indicates the tendon and *e* the ends of the muscle fibres *b* is a nerve fibre and *c* its ramified ending about the spindle Let the tendon become taut in muscular contraction and the fine branches of the nerve fibre will be squeezed and so stimulated (*From Cajal*)

2 *Receptors for posture and equilibrium*

The function of the semicircular canals of the inner ear was until recently a mystery, since they were known to contribute nothing to hearing It is now found that the three bony loops adjusted to the three planes of space (see Fig 3) contain, just before their junction with the utricle, patches of matted hair cells which project into the liquid which fills the canals and are stimulated by its continual oscillations in relation to bodily motion Similar structures within the utricle and saccule are thought to preserve the posture of the body in relation to gravitation The fibres from these organs are in close correspondence with the little brain or cerebellum

C. INTEROCEPTORS

1 *Taste-buds*

Opinions differ about whether taste-buds should be classed here or with the exteroceptors The taste stimuli come from without, so that, in that sense, the receptors might be considered exteroceptive, but their stimuli are only operative when in solution within the mouth, that is, within the opening of the food canal, moreover, their functions are concerned with internal, visceral activity, so that Herrick has classed them with the interoceptors Their organs are bunches of sensory-cells tipped with hairs which project into the little pits or trenches in the tongue and parts of the pharynx, hence *dry* substances cannot be tasted The organs are variously distributed sweet buds being thickest at the tip of the tongue, bitter at the back, and sour and salt at the sides

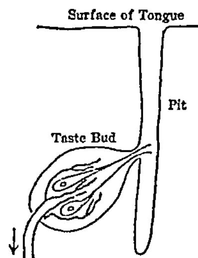


FIG 6—Diagram of the taste receptors

2 *Visceral receptors*

(*a*) Attempts have been made to localize the organs for *hunger* and *thirst* sensations Cannon[1] thinks that hunger sensations are aroused by contractions of the stomach and alimentary canal which take place periodically, but with greater intensity when the stomach is empty In fever and extreme fatigue hunger is not experienced, and this would be accounted for by the fact that such contractions do not occur in these states in spite of the emptiness of the stomach Thirst is thought to arise from local dryness in pharyngeal nerve-cells Other organic sensations, digestive, respiratory, circulatory and reproductive, are experienced from the viscera Their organs seem to be of the kind found among cutaneous and kinæsthetic receptors, but so far little has been done to track their mechanisms, which do not lend themselves easily to experimental investigation

II THE ORGANS OF CONNEXION

(*a*) *The Neurone*—The whole nervous mechanism is composed of cells called neurones The neurone is as Marston says, The structural, functional and nutritive unit of the nervous system'[2] The number of neurones composing the human brain is estimated at about nine billion two hundred million.

They are of three functional types, namely *afferent* or *sensory*, receiving the impulse in the receptor organ and bearing it towards the centre (*ad fero*, I bear towards), *central*, *intermediate* or *intercalary*, connecting other neurones in the central system, and *efferent* or *motor*, bearing the impulse away from the central system to an effector organ (*ex fero*, I bear away)

The neurone is of highly specialized protoplasm It has three main parts the *cell-body*, and *processes of two sorts*

The cell-body contains a nucleus and nucleoli Its protoplasm contains granular masses called the *nisl granules* which stain easily for examination, and vary in shape and arrangement their function may be nutritive or conductive or both

One sort of neurone process has the function of receiving

[1] *Bodily Changes in Pain Hunger Fear and Rage* W B Cannon.

[2] *Integrative Psychology*, Marston p 85

impulses and transmitting them *to* the cell-body, and is known as a *dendrite* The other sort functions by conducting impulses *away* from the cell body, and is known as an *axone*

In the *afferent* or *sensory* neurones of the cutaneous receptors,

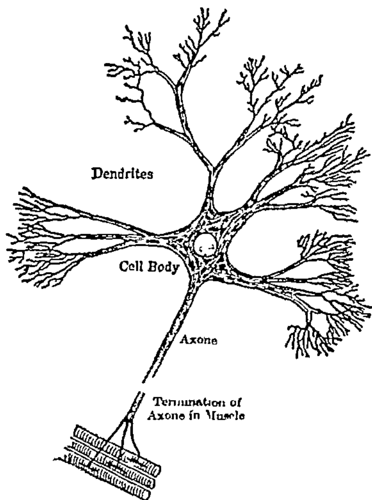


FIG 7 — A motor nerve cell from the spinal cord highly magnified.

the processes which conduct *towards* the cell bodies (*dendrites*) are of a long straight kind some having, for example, to stretch from the extremities of toes and fingers to the spinal cord whereas those conducting *away* from the cell bodies (*axones*)

are short and comparatively thick and branched, having to reach only from the cell bodies or ganglia just outside the cord to the grey matter within it In the *efferent* or *motor* neurones, on the other hand, the short branched processes lead towards the cell bodies in the grey matter, and are dendrites and the long straight processes lead away from them to the muscles, and are axones [1]

In either case, the short branched processes are of the same unsheathed greyish substance as the cell body They increase the nutritive surface of the neurone and its opportunities of making connexion with other neurones In the larger cells these processes are granulated

The longer, straighter processes are similarly of a uniform structure They are whitish in colour on account of the medullary sheath which encloses them, and are unbranched except in some cases for one or two collaterals given off more or less at right angles Within the sheath are the neuro-fibrils, the fine fibrils which pass unbroken through the dendrites and cell-body, skirting the nucleus and running along the axone until they fine out into the arborization known as the *end-brush* Not more than one such process is present in any neurone

(*b*) *The Synapse*—Nerve impulses pass from neurone to neurone in wide radiations through the nerve-net, and the place of contact or juncture of one neurone with another is known as a synapse There are two theories of its structure (1) That the neuro-fibrils pass unbroken from neurone to neurone, a theory not generally accepted (2) That contact is made without continuity, and that there is a surface of separation between the end filaments, so that each is complete in its own membrane On this theory contact is made on the spark principle Synapses occur when an axone conducting an impulse away from *the cell-body makes contact with the dendrite or the cell body* of another neurone

The nerve-current (or *neurokyme*, as McDougall,[2] following Vogt, proposes to call it) is an energy *sui generis* its propagation

[1] Another but somewhat confusing terminology reserves the name *dendrite* for all the short branched processes whether of dendritic or axionic function and the name *axone* for all the long sheathed processes.

[2] *Outline of Abnormal Psychology* McDougall p 27

seems to be electro-chemical and self liberating in character, that is, its passage seems to free energy within the cells traversed, by a katabolic process Thus Sir Charles Sherrington writes

> ' The signal as it runs creates a tiny electric current which propagates itself along the nerve fibre Professor Adrian has now in numberless cases succeeded in rendering this both visible and audible even in a single fibre The signal involves freeing of energy and development of a temporary electrical leak which will travel along the fibre or over the nerve net By repolarization in the wake of the signal the transmitting surface is repaired and made ready for a second signal [1]

So far as is known all such current is of the same type, bare current To quote the same authority

> ' This travelling signal wherever met in whatever nerve-thread, or arisen at whatever point, eye, or skin, or ear, or within the brain or wherever going is practically one and the same event, whether it will excite or whether inhibit there is nothing in its appearance to show '

The modifications effected in the *passage* of the current by the intervention of a synapse are, however, regarded as of utmost importance The following points sum up present-day theories —

1 The impulse encounters greater resistance at the synapse than in the passage along the fibre itself, it is thus slowed down and loses some of its intensity

2 The impulse may be inhibited altogether at the synapse

3 Impulses too weak to pass the first time may by repeated attempts overcome resistance by a *summation of effects*

4 Repeated discharges of nerve impulses across the same synaptic connexions lower the threshold of their resistance This is the neural basis of all acquired facility and habit formation

5 On the other hand, the synapses are more susceptible to fatigue than the neurones themselves, so that a too successive activity at the same juncture raises the threshold of its resistance

[1] *The Brain and its Mechanism* Sherrington (Rede Lecture 1933) pp 10-11

6 The synaptic membrane is also more sensitive than the fibres to changes in the blood supply, its resistance is raised by drugs and narcotics, such as alcohol and chloroform, and lowered by stimulants, such as the caffeine contained in tea and coffee

7 Two separate impulses arriving at the same synapse simultaneously either reinforce or conflict with one another, that is, they effect either *facilitation* or *inhibition*

8 The conduction across a synapse is always in a forward direction

Thus the synapses may be regarded as important nodal points for the switching of current in this or that direction across the nerve net, or for its inhibition They will be further discussed in the account of the working of the nervous system which follows, and they will be borne in mind in the later discussion of the learning process

III EFFECTORS

The effector organs are of two classes, each with two subdivisions

(*a*) *Muscles*, striped and unstriped
(*b*) *Glands*, duct and ductless

(*a*) (i) The *striped or striated muscles* of the skeletal system, which are the *somatic* effectors, are about 500 in number in the human body They are excited directly by the axones of motor nerves which fine out at their terminals into branches fitted with *end-plates* which make contact with the muscle fibres Muscular fatigue arises partly from the effect of continuous stimulation upon these end plates *Muscle tonus* is preserved through the co-operation of afferent impulses from the kinæsthetic receptors with efferent impulses through the motor nerves, these being co-ordinated mainly by the unconscious activity of the cerebellum, in this way muscles are kept, in some degree even in sleep, at a continuous tension which preserves poise and keeps the organism prepared for action Many of the muscles work in pairs (see Fig 9) and the principle of *reciprocal innervation* insures that when the flexor is stimulated the extensor is inhibited, and *vice versa*

(ii) The *unstriped or smooth muscles* line the inner cavities of the body, the blood vessels, bronchial tubes and glands, the muscles of the lens and iris, and the hair raising muscles of the skin are smooth muscles, so also are all the muscles of the viscera, with the exception of the heart muscle. Muscular tone is preserved in the smooth muscles also Their reaction is normally slower than that of the skeletal muscles, and is not under the direct control of the central nervous system, as will be explained later, they are susceptible also to stimulation by chemical compounds in the blood

(*b*) (i) The *duct glands* or glands of external secretion are no new discovery They deal largely with excretory, digestive and reproductive functions, and include the tear, sweat, mucous, salivary, gastric, milk and sex glands, as well as the liver, pancreas and kidneys

(ii) The *ductless or endocrine glands* or glands of internal secretion, are a comparatively recent discovery, arousing much interest for their relationship to behaviour and personality Some of these structures were thought to be mere vestigial remains, until it was found that they manufacture secretions, known as *hormones* (stirrers up) or *autocoids* (remedies) which are absorbed into the blood-stream and have marked effects upon the smooth muscles, and hence upon the glands, including the endocrine glands themselves Hormones or autocoids are sometimes inhibitory,[1] sometimes excitatory They thus form the great co-ordinating mechanism of the body, controlling and integrating the growth, development, rhythm, and reaction speed of the organism by a process, not of segmental stimulation, but of chemical suffusion Though their functions have become known largely through the pathological effects of excess, defect or removal, these more spectacular aspects must not divert attention from the value of their normal regulatory functioning

A brief account of these glands must here be given

1 *The Pineal gland*, within the brain, is thought to work for the general growth of the body in opposition to sexual development, which is much accelerated by its removal

[1] Inhibitory autocoids are sometimes distinguished by the name *chalone*

ii *The Pituitary gland*, attached to the base of the brain, is essential to life The anterior lobes, if over active, produce gigantism, and at some stages disproportionate development of the extremities The posterior lobes yield secretions which stimulate contractions of the intestine, bladder and uterus, regulate menstruation, and can be administered to hasten or assist child birth

iii *The Thyroid gland* in the neck secretes a hormone, the extract of which is known as *thyroxin* and contains 60 per cent iodine Its function seems to be to regulate the body metabolism A deficiency of the gland in infancy produces *cretinism*, characterized by stunted growth, large head, dry skin, poor hair, and mental deficiency This can now be overcome by timely administration of the extract. An excess of thyroid produces a condition similar to that of fear, characterized by nervous irritability, perspiration and protruding eyeballs Thyroid disturbances are also responsible for *goitre*, due in some places to lack of iodine in the local water supply

iv *The Parathyroid glands*, which overlie the thyroid, are essential to life, they also affect the body metabolism, especially the calcification of teeth and bones in childhood They probably have a restraining effect upon the organism, preventive of over-exertion

v *The Thymus*, situated in the upper part of the chest, normally atrophies after puberty, delay in doing so retards or prevents the appearance of the secondary sex characteristics, premature atrophy results in precocity and stunted development.

vi *The Adrenal glands*, situated just above the kidneys, have been closely studied by Cannon in their relation to the emotional reactions in fear and anger which powerfully increase their normally tonic secretions Excessive adrenal secretion produces dilation of pupils, erection of hairs, constriction of blood vessels, inhibition of digestive processes, liberation of sugar from the liver, propulsion of blood from abdominal viscera into heart, lungs, limbs and central nervous system, heightened blood pressure, and increased facility for blood coagulation The fluid, known as *adrenin*, is now chemically manufactured as *adrenalin*

vii *The Sex glands* produce not only the external secretion from the sex glands proper (the gonads), but also an internal secretion the organ of which is sometimes distinguished as the *puberty gland* This affects the secondary sex characteristics, that is the beard and deep voice of the male, and the long hair and rounded figure of the female The gland seems to affect the youthfulness and activity of the other glands, hence investigators are tracing a connexion between senescence or old age and the declining output of these glands

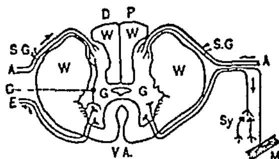


Fig 8—Diagrammatic cross section of the spinal cord

W W, white fibrous matter
G G grey cellular matter
A afferent sensory fibres passing through *S G* the spinal ganglion, into the posterior horn of the grey matter
E efferent motor fibres, most of which lead to muscles like *M*., many of which connect with the sympathetic ganglia like *Sy*
C central cell probably traversed as a rule by impulses passing from *A* to *E*
D.P dorsal or posterior surface of the cord.
V.A ventral or anterior surface

Thus the glands work together, and modify or reinforce one another s effects It is possible that on their first discovery too sweeping claims were made for their emotional influences upon stably organized personalities, but it would be difficult to over-estimate their importance in the regulation of the balanced development of the growing organism

THE SYNTHETIC STRUCTURE AND FUNCTIONING OF THE NERVOUS SYSTEM

Having considered the structural units of the nervous system, it remains to be seen how they are functionally related and

upon what complexities of central mechanism their working depends

The simplest unit of connexion which can produce a reaction is known as the *sensori motor arc*, or more commonly the *reflex arc*

In this a sensory or afferent neurone receiving stimulation (e g from the contact of an object with a touch-spot on the hand) conducts an impulse along its dendrite, past its cell-body which lies just outside the cord to its axone, which transmits it into the spinal cord by the dorsal or posterior horn there making

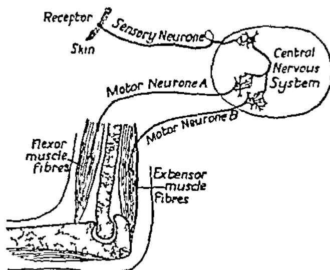


FIG 9 —Diagram illustrating reflex arc.

The impulse transmitted from the sensory cell (receptor) at the body surface occasions an inhibitory impulse through the motor neurone *B* simultaneously with an impulse through *A*, causing contraction of a muscle fibre

synaptic contact with a connecting or intercalary neurone embedded in the grey matter this neurone then transmits the impulse across another synapse to the motor or efferent neurone, which has its cell in the ventral horn of grey matter, the impulse then travels along the motor axone out through the anterior horn to the muscle with which its end plate is in contact, and stimulates it to appropriate reaction (e g withdrawal) Such a nerve pathway is usually shown in a much simplified diagrammatic form In the human nervous system there is probably always a connecting neurone in such an arc, and usually many

more than one Moreover, it has already been shown that even such a simple withdrawal response requires the simultaneous activity of at least two motor neurones for reciprocal innervation of flexor and extensor muscles

Before studying the application of these functional principles to higher level reactions, it will be necessary to take a review of the total structure of the nervous system

It is customary to divide the nervous system into

1 *The Central Nervous System*
2 *The Peripheral Nervous System*
3 *The Autonomic Nervous System* (sometimes classed with the peripheral system)

1 *The Central Nervous System* is that which has all its nerve cell bodies and its synaptic connexions (i e all its nerve-centres) within the *cerebro-spinal axis*, which is contained within the bony structures of the skull and vertebral column

2 *The Peripheral Nervous System* consists of the sensory or afferent neurones which, as has already been seen, have their cell-bodies outside the cerebro-spinal axis, either as with the head receptors within the receptor organs themselves, or as with the cutaneous receptors in strands of ganglia lying just outside the spinal cord Since this system functions as one with the central system and has all its synaptic connexions within the cerebro-spinal axis, the two systems will be treated here as one

3 *The Autonomic System*, which controls the smooth muscles, has both its ganglia and its connecting mechanisms outside the central system and will be dealt with separately

THE CEREBRO-SPINAL AXIS

The cerebro-spinal axis may be divided into the *spinal cord* the *cerebral hemispheres*, and the intervening structures variously termed *mid-brain*, *inter-brain* or *brain stem* by psychologists, though more specifically classified by physiologists, but all contained within the *cranium* or skull

The Spinal Cord is a long strand of nerve-matter extending for about two-thirds the length of the vertebral column. A cross-section shows an H shaped strand of grey matter containing unmedullated dendrites and cell bodies, surrounded by

white matter consisting of ascending and descending axone fibres for vertical transmission Thirty-one pairs of nerves leave the cord from between the vertebral joints, each thick

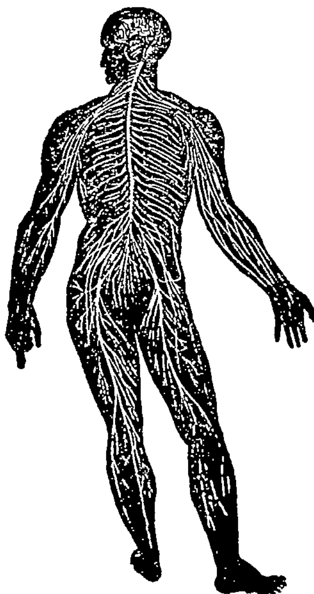


FIG 10 —General view of the nervous system showing brain cord and nerves (From Martin's *Human Body*)

nerve 'cable' consists of a twofold strand of (*a*) sensory fibres forming the dorsal root, and (*b*) motor fibres forming the ventral root, which unite within one sheath after leaving the cord, and gradually taper off as they reach the bodily areas which they serve

The spinal cord is the connecting centre for simple reflex actions of the striped muscles It is also able within its own

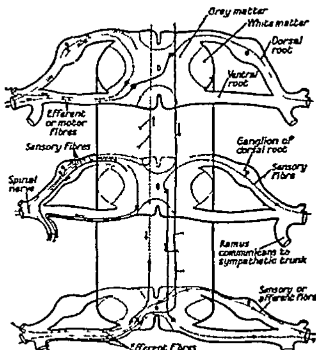


FIG 11 —Diagram showing a few of the neurone paths in the spinal cord and roots of the spinal nerves.
The arrow shows the direction of the nerve impulse

mechanism to bring about simple co-ordinations, either by the branching of the sensory axone which can thus multiply its synaptic connexions, or by the branching of the intercalary or central neurone with which it makes contact, so that through either or both means a single impulse is able to radiate to a number of motor fibres perhaps innervating a team of different muscles, as when trunk and limbs combine in a jumping response to a single sharp pin prick. The spinal cord is also, as will be

shown more clearly below, a conducting path to the higher nerve-centres in the cerebrum

The Medulla Oblongata is the thickened upper extremity of the spinal cord, in it white and grey matter break up their spinal formation owing to the crossing over of tracts of fibres to the opposite side before entering the brain Its function is similar to that of the cord, it is also the great co-ordinating centre for impulses from the visceral organs as it receives the vagus nerve, and thereby exercises an important control over the main life processes, digestive, respiratory and circulatory

The Cerebellum is the small brain situated behind and below the cerebrum, it has several layers of nerve-cells on the outside, and a few large groups of cells inside, and these are all connected up by nerve fibres which run between them and to other parts of the brain It is the great co-ordinating mechanism for proprioceptive impulses, and is apparently the chief agent in maintaining muscular tone, preserving equilibrium and syn thesizing motor impulses

The Thalamus consists of two lobes of nerve-cells called the *optic thalami* situated at the top of the brain-stem in the middle of the fore brain It forms an important sub-cortical centre for sensori-motor co-ordinations, into it run fibres from below which carry up impulses from the sensory nerves of the body, the more complex senses, such as sight, are not represented in the thalamus, though it acts as a relay for visual impulses, for into it run 80 per cent of the optic nerve fibres Haldane and Huxley judge that some dim kind of consciousness seems to be associated with the thalamus [1] McDougall has consistently postulated the significance of the thalamus in emotional reaction, and his view is now receiving confirmation from Dr W B Cannon, who, working with decorticated cats and dogs, claims to have proved its importance for anger reactions, and declares, ' There is good evidence that central control for the expression of these emotions (i e fear, joy and grief), like that for rage, lies subcortically, and, specifically, in the thalamic region, and 'emotional experiences are produced by unusual and powerful

[1] *Animal Biology* Haldane and Huxley, p 140.

influences emerging from the region of the thalamus and affecting various systems of cortical neurones "[1]

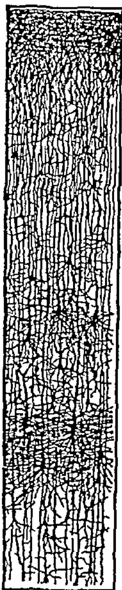


FIG 12.—Magnified section through the cortex to show the complexity of its inner structure (*From Cajal*)

The Cerebrum is divided into two hemispheres, which are so much developed in man as practically to cover the 'old brain' structures and to occupy the major portion of the skull cavity

The outer surface of the hemispheres is covered with the cortex, a layer of grey matter two to three millimetres thick, which contains the unmedullated cell bodies and den drites of the connecting neurones which carry out the intricate co-ordinations which it effects

The surface area of the cortex is increased by numerous convolutions of varying size and depth, the general pattern of which is the same for the human species, but the details of which vary individually The fissures which divide it form the boundaries of the lobes The Fissure of Sylvius divides the temporal and frontal lobes in both hemispheres The *Fissure* of Rolando or central fissure, divides the brain transversely, running in a slightly forward direction Location of cortical function, unsuccessfully attempted by phrenologists *in the* past, is still largely undetermined Some sensory and motor areas have, however, been mapped out Behind the fissure of Rolando is a long narrow area which receives relayed impulses from the kinæsthetic and

[1] *Neural Organization for Emotional Expression* W B Cannon; Quoted *Energies of Men*, W McDougall pp 331 and 332

cutaneous sense organs Immediately in front of the fissure is a motor area which can now be mapped out according to the muscle groups under the control of each section of its surface Other specific functional areas have been located for speech, hearing, smell, vision and so on, as may be seen from the diagram below

There are still large cortical areas, including the whole frontal area, unaccounted for, these are known as *association* areas, and are generally supposed to be concerned with thought and higher connective processes

The inside portion of the hemispheres is largely composed

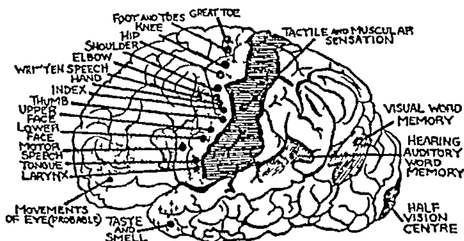


FIG 13 —Diagram of areas of cortex

of "white" matter, consisting of axone fibres, though there are also sub-cortical centres of grey matter, as in the thalamus and around the ventricles The white fibres are of three kinds

(*a*) *Commissural* fibres, which connect the two hemispheres at the base in a broad band, known as the *corpus callosum*

(*b*) *Association* fibres, which intimately link every part of the same hemisphere

These two sets of fibres are the neural agents of integration of cortical activity which normally works in a unified pattern

(*c*) *Projection* fibres, which connect the cortex with the lower parts of the nervous system

Cortical functioning is regarded as essential for the higher conscious processes, and for the more complex co-ordinations

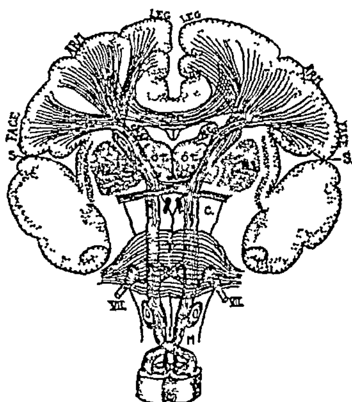


FIG 14 —Schematic transverse section of the human brain through the Rolandic region to show the crossing of motor fibres in the neighbourhood of the medulla.
S fissure of Sylvius
C C corpus callosum.
N C nucleus caudatus, and *N L* nucleus lenticularis of the corpus striatum
O T thalamus.
C crus.
P the pons
M medulla oblongata
VII the facial nerves passing out from their nucleus in the region of the pons

and acquired facilities There is no reason to suppose that any learnt act, however automatic it may have become through

repetition, is relegated to sub-cortical control It must be borne in mind that while all fully conscious activity is cortical activity, all cortical activity need not be conscious

The cortex neither receives sensory impulses direct from the receptors, nor does it transmit motor impulses direct to the muscles It is a final co-ordinating exchange which can prolong the interval between the input and output of nerve-impulse by the interposition of indefinitely complicated intra-cortical connexions Thus in the touch reaction-time experiment the nerve passage was not merely through the spinal cord or mid brain centres, but by a "loop-line to the cortical centres, since the reaction was consciously expected and controlled Moreover, with increase in the choice of alternatives the cortical connexions became more complex, and hence the reaction time became longer

Over and above this co-ordinating function, the cortex can initiate spontaneous activity independently of immediate afferent stimulation It can indeed sustain indefinitely complex chains of associative activity before any corresponding motor outcome need take place Energy psychologists regard the brain as charged with a certain energy tension the current of which works integratively towards continuous readjustments of mental equilibrium

No doubt the loop mechanism typified by the reflex arc may be usefully taken as the structural functional pattern of the connective processes of the higher arcs, but that is no justification for regarding the whole nervous mechanism as a succession of *reflex* arcs, varying in complexity but preserving the same essential character With the development of a cerebral cortex new functions would seem to have arisen which are inexplicable in terms of the older mechanisms, which in point of fact they have largely superseded A decorticated dog makes a far better thing of life than did the cortex less human infant which Edinger and Fischer[1] observed to remain inert, practically impervious to receptor stimulation, unteachable, and incapable of more than the simple vegetative reactions It would seem that the development of higher centres has largely robbed the lower of

[1] *Growth of the Mind* Koffka Ch II, Section 6(*b*)

their autonomy, and many modern psychologists are impressed by the fact that even the deep reflexes, such as the knee jerk, are not entirely unaffected by the integrative influence of the cortex[1] Indeed even the more primitive autonomic nervous system has been discovered to be more under the control of the central system than was formerly supposed

THE AUTONOMIC NERVOUS SYSTEM

The visceral organs are maintained in action throughout life by the circular reflex activities of primitive nerve ganglia or *plexuses* embedded within the organs themselves These are, as it were the automatic clockwork which, unless affected by disease or temporary inhibition, keeps the machinery wound locally

But the regulation of rhythm tempo and intensity is con trolled by two strands of ganglia which run parallel with the spinal cord and are more specifically designated as the autonomic system Fibres from the spinal cord known as preganglionic fibres, pass out and make synaptic contact with these ganglia, which are thus linked with the central system The autonomic nerves are also susceptible to stimulation by the chemical action of the glandular hormones

The ganglionic trands are divided into three parts

(1) The *cranial* division connected with the medulla, favours the digestive processes and has a depressive effect upon the heart lungs tear-gland and pupil It thus tends to the up building and conservation of organic reserves, whilst restraining somatic activity

(2) The *sacral* division, connected with the lower part of the spinal cord, is concerned with the excretory and reproductive functions and is described by Cannon as ' the servant of racial continuity

(3) The *sympathetic*[3] or middle division acts always in an tagonism to the other two sections Where they inhibit, it

[1] Cf W M Marston in *Integrative Psychology* pp 126 ff

[2] *Bodily Changes in Pain Hunger Fear and Rage* W B Cannon p 27

[3] The name *sympathetic* is sometimes used to include all three divisions.

accelerates, and where they accelerate, it depresses It domi ates the other two divisions in the interests of individual preserva tion , and it plays a significant part in emotional reaction It effects are exactly comparable with those brought about by adrenal secretion

* * * * * * * * * *

The student now has before him a comprehensive though brief review of the physical mechanisms and correlates with which he will be concerned in the chapters which follow He will often be required to refer back to these neural bases which will now be taken for granted

CHAPTER III

REFLEX, INSTINCT AND EMOTION

FROM the account of the neural mechanism given in the last chapter, it might be inferred that the infant comes into the world with all his synapses either equally impervious or equally susceptible to the passage of nerve-current,—the neural counterpart of Locke's *tabula rasa* This is not so The young come into the world with an inherited equipment of reflex arcs, that is, paths of low synaptic resistance ready for immediate response to appropriate stimuli These predetermined nerve tracts are located both in the lower, non-cortical centres of the cerebro-spinal system, and in the autonomic system and are of varying degrees of co-ordination and complexity

Reflexes are normally subdivided into two groups

1 *The external or skeletal reflexes,* executed by the striped muscles and controlled by the nerve-centres of the inter brain and spinal cord

2 *The internal or visceral reflexes,* executed by the unstriped muscles and controlled by the autonomic nervous system Both types are aroused by simple physical stimuli which may be either without or within the body

Not all reflexes are ready to function at birth, although the receptors are operative, maturation of the nerve connexions and development of the effectors may still be necessary Reflexes are, however, *unlearnt* responses

Another criterion usually applied is that they are *non-variable* This is relatively true although it is being more clearly recognized that they are in differing degrees subject to modification by cortical functioning

Examples of external reflexes which *disappear* in the course of individual development are the grasping reflex and the

plantar reflex (that is, the fan-like spreading of the toes on stimulation of the sole of the foot)

Examples of "*pure*," *almost unmodifiable*, reflexes are *skeletal reflexes* hand withdrawal (from heat and pain), starting (to sudden noises), *visceral reflexes* iris reflex, snoring, shuddering, trembling, shivering

Examples of reflexes which may be *inhibited, reinforced, or partly controlled*, at any rate in the adult, are *skeletal reflexes* blinking, fixation and convergence of the eye, the knee jerk, stretching, sucking turning the head, kicking, sitting up, standing balancing, and probably walking, *visceral reflexes* accommodation of the lens, yawning, hiccoughing, salivary reflex, blushing, paling, sweat reflexes, swallowing, crying

To sum up reflexes are innate, simple, immediate, definite, more or less unconscious and unmodifiable, reactions to simple physical stimuli, depending upon preformed pathways of low synaptic resistance in the non-cortical nerve-centres, and working for the preservation of the organism

INSTINCT

Instinct is probably the most controversial word in modern psychology—so controversial that it would seem that psychologists are entering into a compact to abandon its use in the study of human nature The crux of the matter has lain between the purposivists who made instinct the great hormic, driving agency, on the one hand, and the behaviourists who saw in it the great example of automatic mechanism, on the other hand

The following definitions,[1] culled from psychologists of differing schools, will serve to bring out these distinctions

1 *Watson* ' A combination of explicit congenital responses unfolding serially under appropriate stimulation.' (*Psychology from the Standpoint of a Behaviourist*, pp 252-253) ' Each element in the combination may be looked upon as a reflex An instinct is thus a series of concatenated reflexes (*Behaviour*, p 106)

2 *Thorndike* There is of course no gap between reflexes and instincts " ' When the response is more definite, the

[1] Quoted (6 excepted) by Bernard *Instinct* Ch. IV

situation more modifiable, instinct becomes the customary term ' (*The Original Nature of Man*, p 5)

3 *Bernard* A specific response to a specific stimulus or set of stimuli.' Instinct is action according to a structural action pattern or it is nothing " There are probably hundreds or even thousands (if we include reflexes under the general heading of instinct) of these inherited mechanisms " (*Instinct*, p 522)

4 *Colvin and Bagley* ' Inherited paths of preferred con duction between stimulation and response ' ' A synthesis of reflex behaviour ' (*Human Behaviour*, p 127)

5 *Koffka* " The instinctive activities are much more like voluntary activities than they are like pure reflexes. At any rate, they possess the same forward direction that is characteristic of voluntary action " (*Growth of the Mind*, p 104)

6 *Drever* An innate, impelling force guiding cognition, accompanied by interest or emotion, and at least partly deter mining action " (*Instinct in Man*, p 20)

7 *McDougall* ' An inherited or innate psycho-physical disposition which determines its possesso to perceive and to pay attention to, objects of a certain class, to experience an emotional excitement of a particular quality upon perceiving such an object, and to act in regard to it in a particular manner or, at least, to experience an impulse to such action " (*Social Psychology*, p 25) ' Native or inborn capacity for purposive action " (*Outline*, p 71)

It is generally considered that instinctive endowment involves some kind of inherited preformed connexions in th nervous sys em Definitions 1 to 4 regard instinctive action as differing from reflex in degree of complexity only, and not in kind Whereas Drever and McDougall introduce the important concept of *motivation*, and thus regard an instinct as essentially different in kind from a reflex, because directed towards a goal

Thus the behaviourists, searching for definite innate behaviour units, have found the indivisible elements or units to be quite minute when finally reached and thus indistinguishable from reflexes, and far removed from the wide social behaviour patterns postulated by the purposivists But having thus emptied their concept of instinct of all suspicion of motivation

(even where they have retained the name), and finding themselves at a loss to give a complete account of human behaviour without some equivalent, they have resuscitated the *urge* under other names, and have resorted to such terms as *urge*, *drive*, or *prepotent reflex* (an illegitimate use of the word "reflex" adopted by Allport)[1] Yet these *urges*, variously listed as *rejecting*, *struggling*, *hunger*, *sex*, and so on, appear as twin brothers to the rejected instincts

In his earlier books McDougall clung to the attempt to combine the purposive aspect with the specific response, although he freely admitted that the latter underwent great modification in human behaviour under the influence of training and environ ment, so that its original pattern might well be unrecognizable Realizing now that the crux lies here, and that the common conception of 'instinct," derived from its typical manifestations among insects and lower animals, seeks and demands a stereotyped reaction pattern, he has recently expressed himself content to forego the extension of the term *instinct* to the innately determined behaviour of human beings[2] Instead he has adopted the term *native or innate propensities* to signify those inborn organized activities which express themselves in the inherent *goal seeking* energies of the human species In the insects and lower animals such propensities or drives are inseparably linked with specific motor mechanisms, as a power-engine may be exclusively geared to one machine which is confined to a set process, thus they may be legitimately spoken of as instincts In man these propulsive engines (the propensities) may be geared to a wide variety of specific machines, which in turn are brought into the service of many engines Thus these two factors, (1) The energy or native propensity, and (2) the machine or reaction mechanism, cannot be profitably considered in indissoluble combination, and must be treated as two factors The element of drive, urge or *horme*, is thus distinguished as *native propensity*, while the modes through which it seeks its goal are separately studied as *innate abilities*, whether *motor* or *cognitive*, from which new abilities are gradually differentiated by growth and training

[1] *Social Psychology* Allport
[2] *The Energies of Men* McDougall p 78

The looser, wider and more varied connexion of these two factors in man and the higher animals has made possible a far greater power of intelligent adaptation, and this would appear to have gone hand in hand with an extension of parental care This has made possible a long period of immaturity, allowing for (1) greater brain development (2) maturation under the influence of varied experiences and activities often playfully undertaken, (3) the benefit of association with the parents during the maturation process, and (4) the consequent imitation of their performances[1]

Yet the inborn propensities of man can mostly be traced in the instincts of the animals below him, so that it is still possible to trace the basic reactions associated with the propensities, so long as no forced attempts are made to keep them tied together at a later stage of development

This change of terminology on McDougall's part, which may well pave the way to more fundamental reconciliation between the divergent views of purposive and behaviourist psychologies, does not weaken the essential distinction which he has always made between *mechanical reaction* or *reflex* and *behaviour* as such There are seven marks (the first five of which he regards as essential) by which he characterizes *behaviour* as distinct from *reflex action* His own phrases are printed in italics in the following synopsis of them[2]

1 *A certain spontaneity of movement, a power of initiative* — Behaviour need not, like reflex action, be aroused by an immediately present physical stimulus This spontaneity in man is largely due to his power of reviving past impressions by imagery and memory recall and of arriving at new conclusions through thought and reasoning so that a new train of innate activity may appear as spontaneously initiated Thus the legs of a brainless dog only react with walking movements when stimulated in a particular manner, whereas the normal dog may wake up and walk off without any apparent stimulus of the walking reaction, or again such a dog may on waking rush off suddenly in search of her puppy

[1] Cf op cit pp 72 74 and 89

[2] *Social Psychology* McDougall p 411; *An Outline of Psychology* McDougall pp 53-57

2 *A tendency to persistence*—This grows out of the first point A train of activity may be sustained long after the cessation of the original stimulus, whereas a reflex action ends with the removal of or from the stimulus, in the same way spontaneous behaviour may persist or recur after a long interval Thus the dog instanced above, if not immediately successful, might continue her search for many hours, or even days

3 *Variation of kind or of direction of the persistent movements*—This McDougall regards as the most significant characteristic Where the simpler reactions fail, the agent may bring into play a great variety of *motor mechanisms*, for example, the dog, in her maternal search, may run, leap, scratch, push The reaction need be confined to no one specific mechanism, where one fails, another can be tried, hence the propensity must ultimately be defined by reference to the situation which evokes it and the goal towards which it is directed The variations will, moreover, be influenced and controlled throughout by a changing sequence of sense impressions, for example the dog would adapt her movements to the route traversed, the scent picked up Compare also the changing tactics of the combatant in relation to his opponent's movements The reflex action has, on the other hand, been shown to be relatively invariable and stereotyped

4 *The cessation of the movements when, and not until, they result in the attainment of the goal*—The propensity to activity persists until its purpose is achieved, whereas reflex activity ceases mechanically with the cessation of the stimulus The dog, for example, would not continue her search after she had discovered her young, as if she had been wound up to it, but would probably begin a new series of expressive movements, —licking, patting barking and so on

5 *Preparation for the coming situation* (*the situation which will result from the action*) *which in behaviour suggests anticipation of that future situation*—Thus the dog will seem to listen at intervals for sounds of her offspring The pugnacious human aggressor assumes a defence guard simultaneously with the first attack. The reflex lacks this anticipatory adjustment.

6 *Some degree of improvement* (*by repetition*) *in respect of efficiency, i.e in respect of speed accuracy, or nicety of adjustment.* —This mark will not necessarily be present, but when it is,

implies the other points Thus the dog, on next missing h pup, would probably go direct to the place of previous di covery, whereas the blinking reflex remains practically ur changed through life and yawning and stretching reactions sho little essential modification

7 *The purposive action is in a sense a total reaction*, that i in fully conative and purposive reactions, at any rate, the whol organism, or all that is necessary, is involved in and dominate by the activity The reflex, on the other hand, is essentiall a localized response through a segment of the nervous system

CLASSIFICATION OF INSTINCTS AND INNATE PROPENSITIES

The classification of instincts has been even more chaoti than the definition At the one extreme psycho-analysts grou into two or three wide class-headings, such as Freud s divisio into Life and Death instincts,[1] or Tansley s [2] into ego, herd an sex instincts At the other extreme is Thorndike s [3] length enumeration of all the specific responses possible in a long lis of situations, which includes, for example, thirty two differen fear responses

Bernard [4] took pains to collect instinct names in curren usage from a number of twentieth-century scientific an popular publications He sums up his results as follows

" The present survey of approximately five hundred book and periodicals, representing slightly over four hundred author employing the concept of instinct, has disclosed no fewer than 849 separate types or variations of types of instincts Finally, when all condensation had been carried as far as seemed possible there remained 325 separate or irreducible groups of types or separate classes " Such is the looseness of popular speech One of the first precautions for a student of psy chology is to watch his use of the term, it is not unusual to hear even reasonably educated people talking about kicking goals, raising their hats, judging their cooking ingredients, arranging

[1] *The Ego and the Id* Ch. IV
[2] *The New Psychology* Pt. VI
[3] *The Original Nature of Man* pp 58-59
[4] *Instinct* pp 187 188

the flowers, matching their colours and turning their ears, all with timely deftness, and "quite *instinctively*."

Yet when all is said and done in this controversy over instinct no general psychology can afford to pass by the deep rooted preoccupations of human nature with food, sex, offspring, society, possessions and self,—call them what it will Into whatever elements they may eventually be analysable they will always demand our practical and empirical study for the under standing and control of human behaviour It is therefore proposed in the subsequent treatment to adopt McDougall's list of *innate propensities* They will indeed be found to include the typical drives, urges, or instincts of the main schools, whether in a more comprehensively grouped form, or in a finer analysis, or in a collateral classification McDougall himself claims no certainty or finality for his enumeration, and thinks it possible that individuals of the human species, or even entire races, may lack one or more propensity common to others

The list is given here *verbatim*, together with the short name which he appends to each for convenience of reference [1]

1 To seek (and perhaps to store) food (food-seeking pro pensity)

2 To reject and avoid certain noxious substances (disgust propensity)

3 To court and mate (sex propensity)

4 To flee to cover in response to violent impressions that inflict or threaten pain or injury (fear propensity)

5 To explore strange places and things (curiosity propensity)

6 To feed, protect and shelter the young (protective or parental propensity)

7 To remain in company with fellows and, if isolated, to seek that company (gregarious propensity)

8 To domineer, to lead, to assert oneself over, or display oneself before, one's fellows (self assertive propensity)

9 To defer, to obey, to follow, to submit in the presence of others who display superior powers (submissive propensity)

10 To resent and forcibly break down any thwarting or resistance offered to the free exercise of any other tendency (anger propensity)

[1] *Energies of Men* McDougall pp 97-98

11 To cry aloud for assistance when our efforts are utterly baffled (appeal propensity)

12 To construct shelters and implements (constructive propensity)

13 To acquire, possess, and defend whatever is found useful or otherwise attractive (acquisitive propensity)

14 To laugh at the defects and failures of our fellow creatures (laughter propensity)

15 To remove, or to remove oneself from, whatever produces discomfort, as by scratching or by change of position and location (comfort propensity)

16 To lie down, rest and sleep when tired (rest or sleep propensity)

17 To wander to new scenes (migratory propensity)

18 A group of very simple propensities subserving bodily needs, such as coughing, sneezing, breathing, evacuation

It is generally recognized that such propensities are not uniformly operative in individuals They differ not only from individual to individual, but in the same individual at different times Thus some are said to be *periodic*, because they manifest themselves in cycles of longer or shorter rhythm, of such are the sex and the food-seeking propensities Others are said to be *delayed*, because they are not manifested immediately after birth, but require longer or shorter periods of growth and maturation of the organism, or are dependent upon an appropriate stimulation which may be delayed, in such propensities a specific form of overt action is especially difficult to trace. It has also been said that 'instincts' are *transitory* and fade away if not exercised and made firm by habit, this was the view of William James[1] The general pedagogical bearing of these views is that the genetic development of the individual should be studied in considering the best stages for the presentation of particular subject matter, and the best methods of introducing it James's advice still holds, "Strike while the iron is hot'', but many a modern pedagogue has more need of the advice, 'Do not strike until the iron is hot.'

The social environment plays upon the innate propensities in such a fashion as makes it impossible to say of any behaviour

[1] *Principles of Psychology* Vol II pp 398-402, *Text-book of Psychology* pp 402 406

complex that it is either wholly inborn or wholly acquired The great regulators and modifiers of human action are the two fundamental *feeling* qualities of *pleasure* and *mental pain* (or unpleasantness) Thus the pleasurable reaction which accompanies successful striving tends always to be prolonged and repeated, whereas the unpleasant, because unsatisfactory, reaction tends to be discontinued and subsequently avoided Thus pleasant and unpleasant affects, though not the motive forces of behaviour, represent the steering gear which directs its course

Feeling, as will be seen in the subsequent section, is closely associated with emotion Every human behaviour process may be traditionally regarded from three aspects (1) The *affective* or feeling aspect, commonly expressed by our "liking or "disliking" of the current experience (2) The *cognitive* aspect (from *cognoscere*, to know) (3) The *conative* aspect (from *conari*, to strive)[1] At any one time all three aspects are present, but not all three are equally dominant Thus at a tennis match *conation* is probably uppermost in the players, though they cannot neglect cognition of the strategy of the game, and will also entertain varying feelings attendant upon the success or failure of their strokes, *cognition* will be dominant in the umpire, though he will require conation to observe and follow the game, and is likely to find his task varying in pleasant or unpleasant affects, *affection* will probably be most obvious in the onlookers who nevertheless *strive* to observe (conation) and take account of the score (cognition)

The affective and conative aspects are often distinguished from the cognitive by the adjective *orectic*, thus making a two-fold division of mental experience into *orexis* (from the Greek word meaning *longing*, *endeavour*, *appetite*), and *cognition*[2]

A study of emotion will make clearer the connexion between the conative and affective aspects of human behaviour

[1] Dr F Aveling stresses a further distinction between *conation* or striving and *volition* which *resolves* and *chooses* but is not necessarily effortful in itself though it may and often does initiate effort cf *Personality and Will*, Ch V *Directing Mental Energy*, Ch X, and *Brit Jour Psych*, Vol XVI, Pt 4 April 1926

[2] Or *noesis* see Ch X below

EMOTION

A few years ago a Conference on Emotion was held in America and its symposium[1] duly published It was largely a confession of ignorance, and bore witness to wide diversities of opinion.

Nevertheless those psychologists who accept "consciousness" would probably agree in assigning the following *constituent elements* and *characteristics* to emotion

1 *Visceral changes*—A strong element of *organic sensation* arises from changes in the viscera brought about by the action of the sympathetic nervous system, and, in some, if not all, emotions, by the endocrine secretions These disturbances usually affect the digestive, respiratory, circulatory and possibly reproductive systems, in ways which can often be introspected and have also been submitted to objective tests Such changes, and the sensations arising from them, have been found to be identical in some otherwise very different emotions, such as fear and anger The visceral sensations are diffuse, and seem to throw the whole organism into a stirred up state

2 *Kinæsthetic sensations*—Agitation, tenseness, and the other characteristic states of emotion, have their counterpart in muscular innervations, which afford sensations through the impulses from the afferent nerves in the muscles, tendons and joints These innervations may be in preparation for the instinctive reactions as for example the clenching of the fists in anger, or may be the accompaniments of the two following characteristic elements

3 *Facial expression* and *expressive movements*—The beetling brows and sneer of anger, the bulging eyes of fear, the open gaze of wonder, and so on, are typical primitive emotional reactions, however much they may be modified in civilized society Darwin regarded many facial expressions as vestigial remains of useful reactions, thus the curled lip may be a relic of the necessary position for the lip of a fighter whose teeth are embedded in the enemy *Expressive movements* seem to be the out come of an overflow of undirected nervous energy which may

[1] *Feelings and Emotions* by thirty four Psychologists ed M L Reymert 1928 cf especially Ch I Is Emotion more than a Chapter Heading?" by Madison Bentley

discharge either into ill-defined general movements, or into characteristic gestures, such as wringing of hands some of which, like fist-shaking, are relics of appropriate actions These movements usually subside when the energy begins to discharge itself through purposive reactions It has been suggested that subjective differentiation of one emotion from another may be due more to the kinæsthetic accompaniments than to the organic, since the latter present an overlap

4 *Feeling tone*—Although the analysis of feeling must be left until later, it may be noted here that no experiences are so fraught with pleasant and unpleasant feelings as emotional experiences

The purposive psychologists would want to add to this list a further characteristic

5 *Conative drive*—McDougall[1] regards the conative experience as of the very essence of emotion and emphasizes the impulsive character of the latter This point involves a discussion of (*a*) the relation of emotion to instinct, and (*b*) the function of emotion

McDougall, in *Social Psychology* and the *Outline* considers emotion as the *affective aspect of the instinct*, and links up each primary emotion with a corresponding primary instinct, and presumably this may be taken to be the core of the innate human 'propensities' Drever and others deny this duality, and think that an instinct which has free play and works smoothly has no corresponding emotional experience, but that this is aroused only when instinctive action is obstructed Watson and the behaviourists use the term *emotion* for the internal physical reactions themselves, which are regarded as usually preparatory to external instinctive reaction

Opinions differ about the *function* of emotion Some writers such as the French psycho-pathologist, Janet,[2] regard the emotional responses as diffuse, wasteful and exhausting, and a major factor in hysterical disorder Others, following Darwin, attribute to them a biological value in that the physical changes actually serve to equip the organism for the appropriate external responses, thus, for example, the adrenal gland secretions

[1] *Outline of Psychology* pp 317 321
[2] *The Major Symptoms of Hysteria* Janet cf Ch XXI p 334

strengthen the necessary muscles for flight and combat There may be some truth in both views Emotional experience seems to pass through two stages First, there is a *shock* stage, which is merely [1] " unadaptive,' disassociative and disruptive,' and which, if it persisted, would result in some such pathological state as Janet describes But this normally gives way to a *post shock* stage of heightened directed activity It is this hormic energy which appeals to McDougall as the significant aspect of emotion

He [2] also draws attention to the importance of the organic and kinæsthetic elements, for their sensations serve to warn the subject of the activity to which he is being aroused, and their outward expressions provide an important social cue to the onlooker

It is customary in sections on emotion to consider the *James Lange Theory* of emotion James at Harvard, in 1884, and Lange at Copenhagen, in 1885 came independently by experiment to a clearer appreciation of the importance of the organic changes in emotion This led to somewhat extravagant statements James declared provocatively that we feel sorry because we cry, angry because we strike, afraid because we tremble' was a more rational statement than 'that we cry, strike, or tremble because we are sorry, angry, or fearful" [3] In other words, the theory reduces emotion to our awareness of *the organic and kinæsthetic changes which are reflexly or peripherally aroused* immediately upon the perception of the exciting object That is to say, the emotion follows the changes, not the changes the emotion

It is not a very profitable discussion Physiological experiments have not yet proved even (*a*) the necessity of organic sensation for emotion, much less (*b*) that it is *all* that is necessary for it, nor (*c*) that the organic changes necessarily produce the emotion

The first point turns partly upon whether revivals of past sensations in the form of mental *images* [4] are possible for organic

[1] *Psychology from the Standpoint of a Behaviourist* Watson p 44
[2] *Outline* p 326
[3] *Principles of Psychology* Vol II, p 450 *Textbook of Psychology*, p 3–(
[4] See *Outline of Psychology* McDougall p 327

sensations as they are for visual, auditory and other sensations There seems no evidence for denying their possibility Physiological experiment on a dog showed emotional reaction to be possible when organic sensation had been rendered impossible, furthermore, a cat was proved to exhibit anger reactions even when the actual organic changes dependent upon the sympathetic nervous system had been rendered impossible It is probable that more light may be thrown upon the brain centres concerned in emotion by a further investigation of the functions of the thalamus, which McDougall, Cannon and others suspect to be an important differentiating centre [1]

Secondly, it is a great mistake to speak as though the mental awareness of organic changes filled at any time the whole field of consciousness An affective and organic state is never experienced alone, nor even in sole conjunction with a conative aspect and its kinæsthetic accompaniments, a mental state must always include a *cognitive* aspect In point of fact the mind will always be at work upon the exciting situation, using in some measure its powers of memory, imagination and reasoning There is introspective evidence that cognitive powers may be greatly enhanced during emotional crises such as danger of drowning threatened motor or aeroplane accidents If the word *emotion* is to be used substantivally for a complete mental state it must stand for more than 'the mental aspect of organic changes'

Thirdly, Cannon [2] experimented by injecting human subjects with adrenalin, but this did not produce the emotion, though they felt 'keyed up' and liable to emotional stimulation

This problem of emotion presents no new difficulty It was known to the ancients Titchener [3] quotes Aristotle as answering the question "What is anger? in the following words [4] 'The speculative philosopher says it is the desire of retaliation or something of that sort, the naturalist says it is

[1] See *Energies of Men* McDougall pp 321, 332

[2] Quoted Psychology Woodworth p 308 from *American Jour Psych.* 1927 vol 39, p 106

[3] *A Textbook of Psychology*, E. B Titchener 1924 p 479

[4] From W A. Hammond *Aristotle's Psychology* 1902 (condensed quotation)

the seething of the pericordial blood or heat Which of these now is the real physical philosopher? I answer, it is the man who combines both of these characters"

In conclusion "emotional experience' is probably a safer term than 'emotion to express the mental state which is characterized by sensations from visceral changes and muscular preparations venting themselves when unrestrained, in facial and other bodily movements, and accompanied by a strong urge to impulsive action pleasantly or unpleasantly toned In no complete mental state, however, are the cognitive processes absent, so that however much the emotional concomitants may predominate, they will never oust the ordinary cognitive operations, for example of perceiving, remembering and thinking from the concurrent functioning which guides the emotional manifestations

Emotion normally subsides into a *mood*,[1] which has been described as the 'aftermath of an emotion' The effects of an emotion including the physico-chemical changes, outlast the exciting cause, this was scientifically demonstrated by Cannon, who found that it was sometimes an hour or two after a dog s removal before the stomach of his test-cat resumed its normal working Our common names for moods bear out their connexion with emotion, thus a "sullen' or 'irascible" mood follows anger, a 'merry" mood amusement, an affectionate" mood tender emotion, and so on Such a mood renders the subject especially susceptible to the re arousal of the same emotion This is the reason for the children's careful observation of the teacher's morning mood

[1] *Outline of Psychology* McDougall pp 359-360

CHAPTER IV

THE INNATE PROPENSITIES

IN this chapter a brief account of the innate propensities in their normal biological functioning will be given, following McDougall's [1] classification and his treatment in the main In the next chapter their organization into sentiments, and thence into character in its relation to will, will be discussed on the same hormic lines, so far their manifestations in normal conscious activity will be solely considered In Chapter VI the theories of the psycho-analytic and analytic schools will be reviewed and an attempt made to sum up some of their tenets about the significance and mechanism of the unconscious mind Finally in Chapters VII and VIII the conscious and unconscious factors of mental life will be dealt with synthetically in the consideration of some of the problems of emotional and personality development with which the educator is chiefly concerned

THE INNATE PROPENSITIES

1 *Food seeking propensity*

Food seeking or hunting forms one of the basic instincts and main preoccupations of most animal species It is overlaid in man by the complexity of its civilized modes of gratification

The *excitant* is judged by Cannon [2] and others to be interiorly the hunger contractions of the stomach and lower œsophagus, without which the outer accessory stimuli of smell and sight of food would be inadequate, and in thirst to be a dryness in the cells of the mucous membrane of the pharynx Some

[1] *Social Psychology An Outline of Psychology Energies of Men.* Specific references will not be necessary apart from quotation.

[2] *Bodily Changes in Pain, Hunger, Fear and Rage* Cannon Ch. XIII

physiologists consider the real excitant to be the general condition of blood-tissue impoverishment, and not the local references

The *impulse* is strong in proportion to the felt or anticipated need, in times of starvation, as under siege and other famine conditions, the impulse, more especially towards the slaking of thirst, can be of ferocious intensity It seems most strongly developed in the carnivorous animals who depend upon a precarious food-supply In a few species such as the squirrels storing reactions obtain, but these seem to be connected usually with the developed foresight of man s mental equipment

The *emotion* is named by McDougall gusto appetite, or craving in the narrower sense Its affective aspect undergoes two phases, respectively pleasant and unpleasant, corresponding to its two physical stages The first hunger contraction stage is accompanied by changes in blood pressure and distribution, flow of saliva and gastric juices At the same time there is a general unpleasant restlessness, loss of concentration upon other activities, lassitude headache and irritability With the finding of food there is immediate diminution of hunger contraction and increase of gastric secretions as Cannon[1] has demonstrated, and a corresponding increase of salivary flow, which, as Pavlov found may begin with the first intimation of satisfaction all these reactions may be to sight smell or sound of food, prior to gratification With the taking of food a further set of reactions controlled by the cranial nerves and including pleasant, soothing affects, supervenes

2 *Disgust propensity*

The *excitant* seems originally to be an objectionable taste or smell It is difficult to know whether there is any original tactile stimulus, for example a hairy or slimy object, as McDougall thinks Watson did not discover one

The *impulse* is primitively the ejection of the noxious substance from the mouth, and more generally, a shrinking avoiding reaction with the head turned away and the hands thrown forward to ward off the object The *emotion* of *disgust* or

nausea has not had its organic reactions systematically analysed, disturbance in the digestive functions, even vomiting, are characteristic. The facial expression distorts the mouth and nose in particular, the lips continuing to emphasize the movements of ejection, and emitting ugly shuddering sounds The affect is peculiarly unpleasant

Its primitive function is no doubt to protect against poisonous and putrid foods It inclines to ally itself with fear

3 *Sex propensity*

The sex propensity is biologically linked with the parental propensity One of the main contentions between psycho analysis and other schools of psychology turns upon the age at which this instinct becomes active

According to Freud [1] it is present at birth, becomes repressed at about the age of seven years, and revives again at puberty Freud classifies as sexual almost all contact stimulation of what he calls erogenous zones, a term not confined to the external genital organs, the mouth is one of these zones and thumb sucking is thus regarded as a sexual manifestation Watson from another angle classifies what he calls 'love responses as amongst the earliest, evoked by stroking of erogenous zones, tickling, rocking and so on For both the sex response is taken to cover movements and expressions of pleasurable tactile and kinæsthetic gratification McDougall [3] and others regard the propensity as beginning to play a part in development in about the eighth year, after which it progresses gradually until the more rapid developments of puberty These views will be more fully discussed in a later chapter Meanwhile the present analysis will be confined to the instinct and propensity in its narrower literal sense

The *excitants* which arouse it are partly internal and partly external The periodicity of the bodily functioning in the

[1] *Three Contributions to the Theory of Sex* Freud II Infantile Sexuality

[2] Cf *Psychologies of 1925* ed C. Murchison Ch II *Experimental Studies on the Growth of the Emotions* John B Watson pp 48 49

[3] See *Outline of Abnormal Psychology* McDougall Appendix pp 565 566

female at any rate, together with the still largely unknown action of the hormones secreted by the sex-glands, probably have excitatory functions which increase susceptibility in the form of a vague restlessness from time to time The external excitant would appear to be the presence of one of the opposite sex, McDougall[1] points out at some length the importance of the secondary sex characteristics up through the scale of bisexual life for the activity of this instinct on its afferent side, the sexes must be able to recognize one another, and the differentiated traits seem also to attract attention and to arouse emotional and conative reaction In the last event perceptual attention must be extended to the external organs themselves

The *impulse* is represented as twofold, first, the approach of two members of the sexes often complicated even in the animal kingdom by coyness, preparatory overtures, and rivalry, secondly, for its completion, the coition which according to the physiology of the species will serve to bring about the conjunction of sperm-cell and ovum for the fertilization of the latter

The *emotion* is misleadingly called *love* by some psychologists, but this wider name is better reserved for the *sentiment*, in which many other elements are included For want of a better word, *lust* is preferred by others as confining the connotation to the specific sexual accompaniments, but it must be kept free from its customary derogatory moral implications The emotion passes through phases of appetite, tension and satisfaction which differ somewhat in the two sexes, corresponding with the different physical reactions As its goal is the propagation of the species, its exercise has normally a pleasant affect

4 *Fear propensity*

The original *excitants* may be classed under four heads

(*a*) *Loud noises* were found by Watson[2] to be original fear excitants in infants, he discovered no original fear response to fur hair, or movement so that it would appear to be the

[1] Op cit. pp 563 564 and *Social Psychology* Supplementary Chapter II for full discussion

[2] These investigations are described with numerous photographic illustrations in *Psychological Care of Infant and Child* by J B. Watson assisted by Rosalie Watson, 1928

bark which the child really fears, and the dog only by "conditioning" or association, similarly, the thunder not the lightning must be the true excitant

(*b*) *Removal of support* was found by Watson to be another excitant. The sense of falling produces fear reactions, as may be seen when an infant is lowered into the bath, it is the removal from the support of a lap and not the bath-water which is the primitive excitant

(*c*) *The unfamiliar* and unexpected are ranked as excitants by McDougall, and perhaps Watson's sudden push or shake to the infant between sleeping and waking belongs here, it would be impossible otherwise at this stage to discriminate the unfamiliar where all is new Masks, unfamiliar uniforms, a new animal, a black or white skin seen for the first time, seem to arouse fear responses as soon as the 'normal' has become familiar

(*d*) *Pain* is another natural fear arouser, as the dentist has good opportunity of judging, and it soon "conditions" everything associated with it

The dark is not apparently an original excitant

The *impulse* is to flee to cover It cannot be shown by the infant, but all species exhibit it as soon as they are equipped for locomotor self-protection It is more marked in the ungulates than in the armoured rhinoceros, in some species cover has to be sought at a distance, in others such as the tortoise it mainly involves withdrawal into a natural protective mechanism The two aspects of flight and concealment are sometimes seen in conflict or suspense, as when a person or animal becomes "rooted to the spot"

The *emotion* has the important *bodily accompaniments* diagnosed by Cannon[1] and already referred to, excessive secretion of adrenin constricts the blood vessels and drives the blood from the abdominal viscera into the heart, lungs, central nervous system and limbs, erects the hairs, liberates sugar or glycogen into the blood for the reinforcing of muscular strength, and thence into the urine, and accelerates the coagulation of the blood at any wound Hence the goose-flesh and the pallor as

[1] *Bodily Changes in Pain Hunger Fear and Rage*, Cannon

the blood leaves the surface for the deeper needs, resulting in trembling, shivering and even teeth-chattering Sometimes there is evacuation of bowels and bladder It is well to remember that the stomach of a frightened child is powerless to carry on the work of digestion, and that his body-capital, the stored sugar in the liver, is being poured out when perhaps no flight is possible, to run to waste in lactic acid The suggestion has been hazarded [1] that this sugar incontinence may even be a provocative factor in diabetes The *facial expression* suggests the bulging eyes of goitre, the corners of the mouth are drawn down, and cries are often emitted The whole *innervation* is towards withdrawal The *affect* is singularly unpleasant This is, of course, a description of the extreme form known as *terror* The 'thrill' in milder forms sometimes affords enjoyment.

5 *Curiosity propensity*

The propensity to explore strange places and things is most highly developed, though with great individual and racial variations in strength, in the human species

The *excitant* 'would seem to be any object similar to, yet perceptibly different from familiar objects habitually noticed " [2] The object must not be too strange or it will evoke the opposing propensity to flight. This attraction to novel stimuli and situations occurs even in infancy, and has been noted by most of the German child psychologists [3]

The *impulse* is towards approach and closer inspection It is the intellectual instinct *par excellence* for it prompts primarily to perceptual exploration

The *emotion* of wonder or curiosity has not been much examined on the physical side In extreme form the respiratory changes the catch in the breath, and even the quickened heart beat are capable of introspection, heightened bodily tone accompanies it and the emotion at times lends great reinforcement to mental activity Its exercise carries a pleasant affect, and its frustration can be markedly unpleasant The typical facial expression is a wide-open gaze, and often a relaxed and

[1] See op cit pp 67-68
[2] *Social Psychology* McDougall p 49
[3] Cf *Psychology of Early Childhood*, Stern, pp 71 ff

open mouth It is often allied with pugnacity, as in difficult invention and exploration [1]

6 *Protective or parental propensity*

The parental propensity cannot be observed at birth or in infancy

The *excitant* seems to be the cry of the young, primarily the offspring, then the young of the same species, and finally, in developed human beings, the cry of the young or helpless of any species

The *impulse* is the care, feeding and nursing of the young, generally seen more strongly in the females of the species than in the males It has been suggested that the animal reaction of licking the young has been preserved in the human action of kissing

The *emotion*, which McDougall calls *tender emotion* has received little or no physiological analysis, and not much definite introspection It is primarily pleasant, but is so soon built into a sentiment with complications of fear, self assertion and so on, that it is difficult to consider it in isolation

McDougall regards this propensity as the mother of both Intellect and Morality' [2] It has already been seen how its development is the *sine qua non* for all higher mental development which must depend both phylogenetically and ontogenetically upon the parental care which makes possible a long period of infancy during which set reaction can give way to experimentation, usually playfully undertaken in the first instance Its moral significance arises from its altruistic emotion which, as it extends outwards to helpless objects in general, may well be a root of disinterested moral indignation and the sense of justice,—hence a powerful factor in the formation of some of the abstract moral sentiments

7 *The gregarious propensity*

The *excitant* seems to be primarily the sight, sound or scent of the herd when separated from it

[1] Good studies of its workings are found in Paul de Kruif's books especially *The Microbe Hunters* and *Men Against Death*

[2] *Outline of Psychology* McDougall p 131

The *impulse* is to join the herd and bury oneself in its ranks Only certain species exhibit this characteristic, mainly it would seem for mutual defence and offence, and only in the higher stages for social co-operation

The *emotion* of nostalgia, the feeling of loneliness or isolation, is unpleasant, and renewed contact with the herd correspondingly pleasant

The primitive propensity merely brings together, it has in itself none of the higher sympathetic reactions found in developed types of aggregations, though it provides the substructure which makes these possible

8 *Self assertive propensity*
9 *Submissive propensity*

The propensities to self assertion and submission are bipolar in their operation. Their definition by McDougall is an important contribution to purposive psychology which has perhaps not been sufficiently appreciated, it forms a useful link with psycho analysis which lays emphasis upon the ego and the ego-instincts

The *excitants* which evoke these instincts are the presence of spectators to whom the subject considers himself either superior or inferior in the relevant respect

The *impulses* are on the one hand to domineer, assert, or display oneself, and hence to prolong and develop the situation; and on the other hand to defer submit and efface oneself from notice The higher animals and some birds are capable of some forms of self-display and of submission, the peacock strutting with tail fanned, and the crestfallen dog slinking away with his tail between his legs, present the two extremes

The *emotions* of elation and subjection have physical correlates which produce in the one the heightening, and in the other the lowering of the bodily tone, though no one apparently has diagnosed corresponding hormone secretions But the whole bearing is affected, and efficiency would appear to wax and wane accordingly In elation the cheeks are brightened, the eyes sparkle the chest is thrown out, and the figure is drawn up to full height, in subjection there is a drooping and a loss of muscular tone The affect of the one emotion is as pleasant

as that of the other is unpleasant,—unless there are other complicating factors to make submission sweet

10 *Anger propensity*

The original *excitant*, though seemingly varied, is amenable to a single formula the thwarting of some other impulse already at work Watson evoked rage responses from infants by restricting the movements of their limbs The force of the reaction depends upon the force of the original impulse at work, a hungry child baulked of the food before it, an ostrich in the breeding season resisting interference with her young, would demonstrate this

The *impulse* is analysed by McDougall into two phases a noisy, threatening, fist-shaking stage, a display of defences to warn off the enemy, and if this fails a silent, destructive stage when all the force goes into the appropriate combative reactions

The *emotion* shows the same bodily changes as have been noted in fear, except for the fact that the face usually flushes instead of paling The facial expression is further marked by flashing eyes under contracted brows, and snarling or sneering upper lip The sounds emitted are cries and growls The whole innervation is towards the opposing object It is the angry blow which has the unreckoned force Again the angry child draws on physical capital, and his digestive system is put out of action The affective tone depends chiefly upon the efficacy of the reaction, it is especially pleasant when linked with successful self assertion

11 *Appeal propensity*

The appeal propensity is described by McDougall as the key which unlocks the parental impulse

The *evoking situation* is the failure of all attempts to achieve a goal, even with the combative impulse in action.

The *impulse* is the abandonment of other effort and the emission of a cry of distress for evoking aid

The *emotion* of distress is generally accompanied by tears and painful affect

12 *Constructive propensity*

Construction is very obvious in some animals, and peculiarly so in the nest building of birds, and the dam-building of beavers, and apparently lacking in other species at divergent scales of evolution. It is a moot point whether its earliest manifestations in human life are for adornment or for use, if it is taken to include clothing activities such as bead threading and metal work, some cave-dwellers used mural decorations, and the origins of huts, leaf-bowers and tents are lost in the mists of time, as also are the beginnings of implements and utensils Present archæological discovery is pushing back the dates of the constructive arts far beyond the periods once estimated Ontogenetically the mud-pie and sand-heap activities of the infant are usually cited, but again nature and nurture are so interwoven by the time the child reaches the physical opportunity for such expression that they are difficult to disentangle. The naïve satisfaction which seems to attend even the most elementary constructive achievements would seem to indicate the existence of an innate constructive propensity Its relationship with the sex propensity which seems suggested by its connexion with personal adornment and home-making has often been stressed, with the implication that its energy may derive wholly or partly from this, for which it is considered to afford a ready sublimation.

13 *Acquisitive propensity*

Acquisition is not present in all animal species, and in those concerned seems connected with the food-supply, as in the squirrel s storing of nuts It is difficult to trace its roots in man, and it is rather by its prevalence than its definiteness of characteristic that it has been included by some psychologists in the inventory of instincts McDougall distinguishes two aspects of it, namely, a collecting, garnering activity, represented by the gambler s attitude, and a hoarding activity represented by the miser's attitude towards what has already been acquired The strength of the impulse seems to vary considerably in races and in individuals Its manifestations are necessarily impossible until some kind of intellectual discrimination of

meum and *tuum* has developed, meanwhile habits have been trained and it is difficult to tell how much is native It is certainly possible to see very strong manifestations of possessiveness, which have never been deliberately trained or encouraged, in very young children. Great pleasure and satisfaction seem to accompany the sense of ownership or possession, and to be reflected in a certain gloating complacency of expression The outcome of a colossal political experiment for its eradication may in time show whether the impulse to possess has an ineradicable hereditary core or not.

14 *Laughter propensity*

Laughter would appear to be the one human propensity which is not shared by any other species It seems on that account to have suffered the neglect of psychologists though philosophers have sometimes given it attention McDougall has treated it in the *Outline* [1]

The *excitant* has, he suggests, two characteristics essential to the ludicrous (*a*) something inappropriate and maladjusted, like the small hat on the large clown, or the undignified slip of the elderly gentleman on a frosty morning, (*b*) something mildly distressing, or which would be so if it happened to ourselves Tickling is a crude, primitive excitant which he suggests derives its evoking power from the ludicrousness of so much discomposure resulting from such a trivial provocation

The *external reaction* is the concatenation of strange and usually unmusical noises known to all

The *emotion* of amusement has physiological accompaniments in the stimulation of respiration and circulation, the raising of blood pressure, and the rush of blood to head and brain, causing redness of face. There is bodily relaxation, often rhythmical swaying movements, with the head thrown back. Any train of mental activity is broken up McDougall suggests that the high sympathetic potentiality existing in a gregarious species of developed perceptions and emotional susceptibilities would become unbearable, if the ludicrous aspect were not apprehended, to cause the relief of laughter, which thus acts as a salutary and refreshing *antidote to sympathy*

[1] *Outline of Psychology* pp 165 ff

15, 16, 18 *Comfort, rest, and other propensities* serving bodily needs, as they are more definitely connected with the physical organism, do not require psychological consideration here.

17 *Migratory propensity*

This propensity is one which very definitely exists in some species and not in others, its nicest manifestations are, of course, among the birds where migration still remains the most fascinating mystery of instinct, yet some species migrate and others do not, just as with the mammals Attempts may be made to prove the existence of this propensity in the human species by pointing to the migratory movements of tribes and races which make up much of the world s history, or ontogenetically to the difficulty every nurse and mother experiences in penning within safe bounds the youngest infant who can crawl, or to the prevalence of truancy amongst older children (which, however, happier educational conditions have done much to decrease), or to the steady migrations of adult individuals which immigration laws strive hard to control. It seems probable that there is an innate human propensity to wander to new scenes which is largely counteracted by incompatible propensities and sentiments, when the situations which evoke protective, sex, gregarious, acquisitive, food seeking, comfort or other propensities are attached to the home base and find their satisfaction there

Disposition

Although, as has been seen, these propensities seem for the most part to be present in the races and in the individuals of the human species, their relative strength would seem to differ considerably both among races and among individuals, either by original inheritance, or by use and disuse in the course of experience The relative strength with which they are present constitutes the *disposition* Where one propensity is remarkably developed or else entirely lacking, this often characterizes the disposition, thus popular speech classifies dispositions as gluttonous, fastidious, amorous or lustful, timid, inquisitive, tender or affectionate, sociable, unsociable, pushing, retiring, pugnacious tearful or querulous, grasping or miserly, merry or solemn.

Three other general types of behaviour, closely related to the propensities though not in themselves propensities because not directed to any specific goals, call for comment The terms "suggestion," 'sympathy" and 'imitation' represent descriptive class names for types of behaviour which are linked under each head only by the specific method of their arousal, which in each case is intimately connected either with some general characteristic of the working of the propensities, or with one or more of the propensities themselves Suggestion, sympathy and imitation are probably all in some measure dependent upon gregariousness, for they may be regarded as three different means of contagious production of reaction in a subject by its experience in another On the *cognitive* side the production of a belief, idea or mental set in one individual by the experience of it in another is known as *suggestion*, on the *affective* side the production of emotion through the expression of it by others is known as *sympathy* in its simple, passive form, on the *conative* side the production of external behaviour through the exhibition of it by another is known as *imitation* It is probable that the emotional side is the most fundamental side which predisposes to the other two tendencies

Sympathy of the simple passive kind, as distinct from the active sympathy based on intellectual comprehension, accounts for the contagion of emotion such as is experienced in a crowd when fear spreads into panic, often with little or no knowledge among its members of the original exciting cause Laughter has the same infectious quality McDougall explains this sympathy as 'founded upon a special adaptation of the receptive side of each of the principal instinctive dispositions, an adaptation that renders each instinct capable of being excited on the perception of the bodily expressions of the excitement of the same instinct in other persons [1] It thus follows that those instincts which are accompanied by the most marked emotional expressions, vocal facial or motor, are the most liable to be sympathetically aroused Such contagion only occurs in a gregarious species, and is strongest amongst those most closely akin in native endowment and in social development Emotion is thus enhanced by being mutually experienced

[1] *Social Psychology* McDougall p 81

there is, as it were, the double arousal, through the normal perceptual channel, and through the sympathetic inlet. Thus the jokes or thrills of a play or talkie win their most appreciative responses from a full house Gustav le Bon [1] and other writers on crowds have drawn attention to the degeneration of rational thinking produced by the intensification of such shared emotions.

It must be noted that if a strong opposing emotion is present in any individual, such a person will be immune from this sympathetic contagion, for example, the mother whose child is being trampled upon in a crowd may experience only the most intense pugnacity, and the subject of the laugh does not always join in the mirth,—quite other emotions may continue to dominate him

Races and individuals differ widely in their susceptibility to such contagious stimulations It is this strong sympathetic tendency which gives the Bantu his charm of ready smile or seriousness

The most susceptible individuals are not necessarily the most sympathetic in the active, higher sense of the word, for example, dread of sympathetic pain may actually deter a person from attendance upon the sick or suffering if the character is an egotistical one

Suggestion is a process which waxed much in popularity a few decades ago and now seems to have waned in favour The term has often been loosely applied to any process of argument or persuasion A definition must ensure a restriction which leaves the term with some practical value Bernard Hart [2] has improved upon McDougall s definition by adding a further restricting clause, given in italics suggestion is, he says, "a process of communication whereby a proposition is communicated by one person to another and is accepted with conviction by the latter in the absence of logically adequate grounds for its acceptance, *and owing to the fact that conflicting processes which are or should be present are inhibited*

In considering the factors which enhance suggestibility, account must be taken of the evidence drawn from the extreme form known as hypnotism, a process whereby in varying degrees

[1] *The Crowd* Gustav le Bon (trans. 1896)
[2] *Psychopathology* Bernard Hart p 27

the subject's higher critical mental powers are suspended from normal operation, a method of psychotherapy which Freud himself used in the early days of his practice His explanation of the *rapport* between agent and patient was that it depended upon a sexual attraction on the patient's part. McDougall contests this, for he sees in the process an interplay of the assertive and submissive propensities, and finds most liable to hypnotic suggestion those subjects in whom the *submissive propensity* is strongest. The normal factors making for suggestibility confirm his opinion because they are such as also naturally evoke submission Thus persons are most suggestible to those who hold *prestige* for them, to those whose reputations, qualifications, personalities or insignia impress upon them their superior powers or station and so evoke their submission, the *mass* suggestion of numbers has a similar effect Moreover, *ignorance* is another predisposing factor both to suggestibility and to submission, the child, as would be expected from his smallness and lack of knowledge, has also been proved, by use of the Fidelity of Report experiment, to be generally more suggestible than the adult States of extreme fatigue, sleeplessness, or hysterical excitability are also especially favourable to the uncritical acceptance of ideas, especially to those which possess emotional congruity

The process of *auto-suggestion* was much stressed by a group of workers at Nancy in France, where Dr Emile Coué [1] and his followers effected many cures by instructing patients to repeat the simple formula, "Every day in every way I am getting better and better, between sleeping and waking McDougall would reduce all auto-suggestion to *hetero-suggestion* since even here it would seem to be the personality of the doctor which enables the self to accept the suggestion and make it its own Conversely it might be argued that all hetero-suggestion must in the last event be auto-suggestion, since the idea only becomes operative when actually accepted by the self

Suggestion pervades normal life to a degree which is only gradually being realized Trotter [2] sees in it a dangerously

[1] Probably the best exposition is *Suggestion and Auto-suggestion*, Baudouin.

[2] *Instincts of the Herd in Peace and War*, Trotter

non rational outcome of the "herd instinct." Yet it must not be thought that because the 'logically adequate grounds" are not present to the recipient of the communication they do not exist, the proposition *may* be perfectly true, but that is not the *reason* for its acceptance Suggestion will never be entirely eliminated from life, nor is it altogether desirable that it should be Nevertheless it has its roots in the unconscious mind and represents a type of sub-rational thinking which it should be the aim of education to limit and safeguard Suggestibility, though it is enhanced by ignorance, shows no inverse correlation with intelligence, as Binet expected when he included suggestion tests in his first Intelligence Scale Nevertheless it will be best overcome by training and encouragement of the reasoning powers Hart's codicil 'owing to the fact that conflicting processes which are or should be present are inhibited" indicates the line of safeguard, the opposite argument should at once be brought alongside before judgement is pronounced. Every one knows what it is to be carried away by some inspiring orator at a large gathering, to find that only in the seclusion of the study does the opposite argument present itself, hence the importance of debate procedure, and of parliamentary opposition benches A person is not suggestible if he has an opposing mental set, such as the determination to win his case, but the reverse danger may arise, so that every suggestion arouses *contra suggestibility*, a response no more rational than the positive form Some persons, at any rate at some phase of psychological development, are peculiarly liable to this type of contra suggestibility, some misguided parents even try to manage their children by telling them " to walk on the grass when they are most anxious for them not to do so,—following, no doubt, a counsel of despair

Imitation is a loose, widely used term which has no significance or value as a general formula It is used to cover processes at entirely different psychological levels, and its innateness has been much over-emphasized by the older school of educationists

1 *Deliberate imitation*, in the form of mimicry of action is in fact a rare thing and is always regarded as ludicrous, except where it is adopted as a recognized instrument of learning as, for example in the placing of the lips for a foreign vowel sound, in all such cases considerable *insight* is normally required for

understanding of the correct relations demonstrated It is an outcome of learning rather than of native endowment.

2 The tendencies to sympathy and suggestion which have already been discussed naturally issue in motor effects and these form a large part of what is generally meant by imitation *Sympathetic induction touches off the corresponding innate reaction,* unless it encounters resistance or preoccupation, the subject responds with his own laugh, cough, cry, exclamation of alarm, and not an attempted replica of the other person's

3 *An unconscious or semiconscious wish may often produce imitation,* the would be teacher finds himself adopting the tone or mannerisms which are effective in the older teacher, the tomboy girl picks up the speech and mannerisms of the boys because she would like to be one, the adolescent girl imitates the refined speech of a lady visitor because refinement has become a desirable asset, or it may be that the personal admiration of hero-worship produces a resemblance in walk or handwriting which was never deliberately sought

4 *Dramatic imitation* is sometimes arrived at by sympathetic assumption of a rôle and its outcome in spontaneous reaction, sometimes by the deliberate adoption of relevant reactions which have been carefully observed

Socially, 'horizontal' imitation in the minor ways of life produces fashions, and in lesser trivialities fads and crazes, the rapidity of onset and decline is usually in inverse proportion to their width of range and significance, in more important spheres it makes for social changes which may or may not spell progress "Vertical' imitation of the ancestors and the past makes for conservatism whether in minor superstitions and ceremonials or in the broad traditions and institutions which are the stable structure of any society [1]

These three tendencies have been treated here at some length because they so powerfully affect the later developments of the native endowment as it becomes organized under social pressure, and moulds itself to the social inheritance

[1] For an interesting discussion of social imitation see *Social Psychology* E. A. Ross

APPENDIX TO CHAPTER IV

A few examples of observations by students are appended in illustration of the *innate propensities* as they appear among primary school children. The observations are all culled from concurrent sets of first exercises in recording The value of such exercises lies in the practical direction of psychological interest to concrete everyday human behaviour

For obvious reasons, the children s names have been altered somewhat. The ages, where recorded are given in brackets. Some extracts are from intensive studies of a child some from extensive studies of a group or class. Some of the children s sayings were in Afrikaans and have been translated

1 *Food seeking propensities*

David (7) *smelt the dinner of a neighbouring cottage he said* I can smell that dinner again I wish it was dinner time what s the time ?' all in one breath.

A little boy had a bunch of grapes and quite a number of children came round showing friendliness In no time the child had disposed of his grapes

2 *Disgust propensity*

A child had an open sore on her leg and on finding himself next to her Obed (8) looked at the sore his eyes opened wide his lips curled and he stepped away

I watched Doreen (5) put some plasticene in her mouth , it was hardly in before she had taken it out and thrown it down on the desk while her face was pulled in the most peculiar expression

When a mouse was mentioned in a reading lesson Bettie (7) shuddered and screwed up her face with a very pronounced expression of disgust.

3 *Courting propensities*

In physical culture I noticed that Jean and Maurice (6) were partners wherever possible In one drill lesson I noticed Maurice and Don (5) arguing about who should have Jean as a partner ; each had a hand but Maurice won and Don took another partner

4. *Fear propensity*

One morning while we were working outside on the verandah the wind suddenly blew the blackboard down. Doreen (5) jumped up and ran *behind me before she had even time to see what the noise was For* a moment she clung to me

One playtime Bettie (7) was quite obsessed with fear when another child playfully chased her She ran as hard as she could to me and clung on to my dress and would not leave me for some time

5. *Curiosity propensity*

David (7) was interested in my overall. Asked whether my gown belonged to me or College and whether I had a dress on underneath.

I was wearing a new watch It was not long before Doreen (5) saw it with an Oh! she started to finger it listened to it ticking and then tried to turn the winder

I took a picture to school and put it on the cupboard it was rolled up and this seemed more than Obed (8) could stand He would keep on whispering to me ' What is that picture, Teacher ? or else Teacher I can peep

6 *Protective or parental propensity*

A new child came to school, and when I arrived Zita (6) had taken her into her care. She was holding her hand and after saying This is a new child " kept smiling at her and telling her what to do

David (7) was most concerned when his friend hurt his sore knee at drilling He at once helped him up and took him to the classroom to have his knee rebandaged.

Dorothy (12) is helping to look after and feed a baby swallow, in which she displays much interest.

7 *Gregarious propensity*

Henry (Standard VI) was sitting in a double desk with another boy who was called out to go on an errand and he immediately stood up and asked if he could not sit with another boy who was sitting alone because he did not like sitting by himself

In rhythmic work when the children had to lie down on the floor in the space not touching one another they huddled together and if one found himself isolated he would immediately wriggle back to the others

In the drill class when she is told to find a place alone Doris (6 7) always gets as close as possible to some one else The Sub-Standard A s as a whole are very gregarious, and have only lately grasped the idea of finding a place alone "

David (7) always wants to be included in the fun, e g on the play ground while some boys were whispering he pushed in as well

8 *Self-assertive propensity*

(As seen in Standard V of a girl s school 11 to 12)

The whole class has the self assertive propensity in a highly specialized form

Dorothy is always talking above all the rest of the class trying to tell me what she has done before Ada and Johanna are always asking for help whether they need it or not Alberta draws attention to herself by clacking the seat of her desk, and stamps her feet when she does not get what she wants Emerald and Elspeth persist in answering for every one else Dina and Petronella usually want to fight to clean the blackboard And the whole class are forward in taking my books and collecting from the rest of the class

When we arrived and were waiting for the bell Jessie (12) ran to get her bicycle and rode up and down in front of us

8 and 9 *Self-assertive and submissive propensities*

Edward aged 14, and much retarded is the oldest and lowest in the class, the little boys were teasing him because he could not say his recitation, but he strutted up very proudly and apparently sure of him self when the teacher asked him to open a window that was rather too high for the others

9 *Submissive propensity*

May (8) allows the bigger and older children to lord it over her and to push her out of the drill line

Bettie nearly cried in class when she was scolded for sitting badly She is very small and the youngest in the class.

Delville would not answer and could scarcely give her name when she came to school for the first time When the others laughed she became crestfallen

10 *Anger propensity*

Jessie (12) was waiting for a sewing machine and some one took her place she became very angry and red in the face Luckily this child got up otherwise there might have been trouble

Samuel (13 father coloured, mother white pupil of coloured Mission School) showed the anger propensity clearly when one of the Indian boys insulted him about his parentage. He jumped up in a ter rible rage and with clenched fists and grinding his teeth he flew at the offender In fear the other boy had to use his hands to defend himself but blind with rage Samuel was determined to hurt him The noise he made reminded me of a dog s angry snarl and all I could do was to drag the boys apart and pacify Samuel who stared at me with a wild look in his big brown eyes The other boy was much older and bigger than he

Standard V (11 12)

A dog belonging to a child in the class entered the room and another girl jumped up to take it out but the owner ran up to her and slapped her in the face Her explanation was that the other girl was hurting her dog

11 *Appeal propensity*

John (8 3) is fond of coming to the teacher with piteous tales of how X has pinched him. He looks at one with his eyes full of appeal and with a hurt expression

Bettie is very much of a baby in her ways She is always running to some one for help directly she cannot do her work. If she even mislays anything such as a pencil she will not look for it herself but comes to the teacher with a piteous expression and asks her to look for it

12 *Constructive propensity*

John (8; 3) made a very good mat which he wove quickly and said it would be a present for his mother to put her teapot on.

Although Edward s (14) mental age is very low he is very clever with his hands and excels especially in carpentry When the principal wanted

the seat of a desk fixed up it was Edward who did it. He it was also who went outside and cut branches off a tree and shaped them to serve as pegs for the easel

David (7) is very good at making boats which is a project he is particularly interested because he has travelled by boat.

13 *Acquisitive propensity*

Jack (6 6) has a collection of string, chalk drawing pins and odd pieces of paper of which he is very proud He always picks up out of the waste paper basket any drawing pins which happen to bend or break.

When one boy brought flowers which look like birds to school, all the children wanted one One little boy offered me one and for the rest of the lunch period children on all sides said Oh, Teacher give it to me

When we had a clay modelling lesson the children were all eager to keep bits of clay which were over

A little boy brought a prism to school all the children were very anxious to have it.

Doris (6 7) loves hoarding up the pencils belonging to the other children and invariably starts collecting the reading books before time, and as long as she possesses two or three books works quite well.

14. *Laughter propensity*

I started the class (a sub-standard) on writing instead of phonic work by mistake and on discovering this told them I had made a mistake. They all took it as a joke and laughed heartily and then started their phonic work in a brighter happier mood really working.

15 *Comfort propensity*

Ben (Std. V) will not sit properly and always puts his arms round the back of his desk when he stands he leans against the desk

Sympathy

One of the girls caught her finger in the door and pinched it. Bettie (7) was most concerned about this, and asked if she could sit next to her to make her feel better As this was not allowed she persisted in whispering frequent inquiries after the finger

During one lesson I smiled at one girl who sat back and laughed gleefully and although the others including Maurice, did not know what the joke was they all joined in

Imitation

Doreen (5) was watching some other child recite she imitated her facial expressions and her lips were moving all the time as she mouthed the words

I helped David (7) during reading and he copied the way I read perfectly I always say Yes very nice " his brother showed him his sums his reply was " Yes very nice

In pointing out words on the blackboard the flat hand was used as a marker The children however pointed with one finger but one

day I noticed that Maurice (6) had copied me in using his hand under the whole word. Ever since he has pointed out words in this way, although nothing was said to him about it.

Bettie was taught script, but is now most anxious to change her hand writing "because I want to write like the others.

In a wireless drill lesson first occasion, when children were supposed to do exercises one started and then gradually one after another they followed the first one's example. The same happened when they were asked to sing during a wireless lesson.

One pupil smeared red chalk on her nails and the whole class copied her

Suggestion

If one child goes to get a drink of water Bettie immediately says she is so thirsty that she must have a drink now, but if her attention is dis tracted she forgets all about her thirst.

John (8 3) did not wish to wear spectacles, but it was suggested that all the others wanted spectacles and that great men wore spectacles and John was keen on wearing his spectacles

CHAPTER V

SENTIMENT CHARACTER WILL TEMPERAMENT

THE processes by which the innate propensities and emotions become organized around increasingly complex cognitive dispositions to form the *sentiments*, which in turn become organized into the hierarchy which forms the character, must now be considered

SENTIMENTS

In his *Foundations of Character*, Shand[1] lays it down as a law that "In the growth of character, the sentiments tend with increasing success to control the emotions and impulses, in the decline of character, the emotions and impulses tend with increasing power to achieve their freedom" This conception of sentiment as an 'organized system of conative-emotional tendencies' centred in some object and thus forming a feature of mental *structure*, with a determinant influence upon subsequent modes of experience, has been further developed by McDougall.[2]

LOVE AND HATE

The two characteristic sentiments are those of *love* and *hate* These are formed by the repeated evocation and association of several conative-affective tendencies in response to the same object

Thus a mother builds up a *sentiment of love* for her child by experiencing *tender emotion* towards him in his presence and

[1] *Foundations of Character*, Shand, p 62.

[2] The following account is in the main a summary of McDougall's doctrine as expounded in his *Social Psychology* *Outline* and the *Energies of Men*. Only actual quotations will be further acknowledged directly

upon every recall of his existence, this is linked with strong *self-assertion* in her dominance over his circumstances and behaviour she exhibits *curiosity* about all that concerns the child, she may experience *submission* towards what she considers his perfections, and this, as he grows up, in increasing measure, she experiences *pugnacity* towards anyone who decries or injures the child, and *fear* on his behalf if any danger threatens These reactions repeatedly evoked become built up into a structure which has for its neural basis the linking of a system of nerve-centres by paths of lowered synaptic resistance, probably connected with the thalamus Such a mental structure is there whether the subject is sleeping or waking, it remains quiescent for a large part of the time, but its consistency can be counted upon, and appropriate situations will at once call the relevant impulses and emotions into play The normal student has a range of such sentiments for members of his family, but he does not usually live in the throes of emotional activity towards them, he may sit through half a morning engrossed in study without a thought in their direction, whereupon a letter of good or bad news from home will at once arouse a chain of reactions from within his sentiments reactions more or less predictable by those who have the opportunity of knowing his stock of sentiments For ' A sentiment involves an individual tendency to experience certain emotions and desires in relation to some particular object '[1] Without such constellations' our emotional life would be chaotic and unpredictable Yet no such organization would be possible without the original occasions of emotional experience, ' emotions are episodes in the life-history of a sentiment ' If a child is to learn to love his mother he must be given opportunities for the arousal of tender emotion towards her and be allowed to express it outwardly before it becomes "taken for granted" as organized into filial love The warmth and strength of a sentiment will be the warmth and strength of its ingredients Yet any one conative-affective (i.e orectic) disposition may become a constituent in a large number of sentiments without their necessarily being the weaker for that. Love for one child does not necessarily weaken that for another Each individual has as many sentiments of love as he has objects of love, yet no

[1] *Outline of Psychology*, McDougall, p. 419.

two sentiments will be quite identical in the nature and ratio of their components, thus a mother with ten children may love each one differently according to his needs and characteristics, for example with more or less of assertion or submission, of fear on his behalf, and so on, according to her growing *cognitive* system of knowledge of the circumstances of each, and none of these sentiments will remain stationary, but each will wax, wane or otherwise change with the march of time and experience. It cannot be too clearly stressed that the *cognitive structure* develops parallel with the conative and affective, for as a sentiment grows, so the body of knowledge concerning the object around which it is organized becomes steadily wider and richer

Sentiments of *hate* are generally less numerous than those of love They are likely to have their origin in arousals of *fear* and *repulsion* towards the object, these blending, and being revived with unpleasant insistence upon every thought of the object. In absence and where possible in presence, *anger* burns up against the object, whose actions and whereabouts become matters of interest and *curiosity*, *submission*, due to impotence produced by circumstances, may further complicate the sentiment. Imagine the case of a child who hates a bad tempered or bullying teacher, the latter's threats and punishments repeatedly evoke fear in the child coupled with repulsion at what seems his cruelty, harshness, or other unattractive feature, the child vows vengeance behind his back, pictures retaliation, and may attempt actual defiance, he becomes obsessed by the thought of this teacher, presages his movements and proximities, his own weakness and subordinate state, however, place him in the teacher's power, and by submission he does his best to escape attention Such a set of reactions constantly evoked towards one repeatedly encountered easily develops into a full blown sentiment of hate, which may long survive the physical presence of the object

CONCRETE PARTICULAR COLLECTIVE AND ABSTRACT SENTIMENTS

A further division of sentiments rests, not upon their constituent impulses and emotions, but upon the *type of object*

around which they are organized The simplest and genetically earliest type of sentiment to be formed is one for a *concrete particular object*, such as a particular person, animal, place, book or other inanimate thing Conceptual development, however, soon gives rise to a broader type of sentiment, a *concrete general* sentiment, or a sentiment for a collective object, thus a woman may love not only her own child, but children in general, a child from loving a pet kitten may extend this sentiment to cats in general or to all animals In this way the broad sentiments for home, family, school, race, country, are formed It will be useless to expect this breadth without the particularity of many individual sentiments first formed Finally, as a further stage of intellectual abstraction is attained, sentiments may be formed for *abstract objects* From loving persons who are kind, honest, unselfish, courageous and so on, and hating actions which are cruel mean selfish, cowardly, the individual by repeated emotional reactions to the concrete examples, comes to experience these reactions to the abstracted qualities Such sentiments are usually bipolar, for example, love of truth goes with hate of deceit The strength and range of *abstract moral* sentiments will be determined largely by original disposition and by special episodes in individual experience Historic sentiments can be quoted, such as Abraham Lincoln's hatred of slavery, and Dr Barnardo's love of children, deriving strength from unforgettable episodes in early experience Moses, the Lawgiver, built his passionate sentiment for justice upon his personal observations of and emotional reactions to Egyptian oppressions. It is probable that the most forceful of the sentiments which have moved the world have been from such original, first hand experience. Nevertheless, a second potent factor derives from *the contagious influences of sympathy, suggestion* and *imitation* mediated through the social environment. It is for this reason that admired elders and leaders, and famous schools, colleges and societies which preserve lofty traditions, have special power to mould the developing ideals of the rising generation.

These abstract moral sentiments in their conative effects are probably what the moralists mean when they speak of 'moral habits', habits are primarily motor or mental but if we may speak of a *conative-emotional* or *orectic habit* we

should approximate to the notion of a sentiment, so long as we avoid the idea of anything merely mechanical and automatic, from which the impulsive force has been abstracted [1]

A common mistake of age in its training of youth is to try to impart abstract sentiments verbally (to 'moralize') instead of allowing them to develop through direct concrete individual experience, the main aim should be unostentatiously to supply the occasions for such first hand experiences even though the emotional episodes involved may be disturbing and at times unpleasant. Literature, history and historical biography, and Biblical narratives, afford the great concrete examples for such training, in so far as it can be imparted on the intellectual plane

THE SENTIMENT OF SELF-REGARD

Somewhere between these two classifications of sentiment, and depending for its character both upon the particular impulses and emotions which it embodies and upon the unique object around which it is organized, is the sentiment of *self-regard*

The orectic factors become built around a gradually developing *idea of the self* which must attain a measure of clarity before it can be called the object of a sentiment The infant's earliest realization of his empirical self arises through bodily conditions, he is carried about, finds himself remaining constant in a changing environment, he has aches and pains, visceral, kinæsthetic, cutaneous and other sensations, he becomes a source of movement and can effect changes in the surroundings, a power which he exercises by hurling his belongings over the edge of cot or perambulator Further he hears himself called by a name, and he learns to distinguish animate from inanimate as the former minister to his needs Then through imitation and passive sympathy, he learns to appreciate the meaning of the facial, bodily and vocal expressions exhibited towards him, and associated probably with pains and pleasures Soon he becomes aware of others' attitudes toward himself, and knows when he is considered 'good' and when 'naughty'

[1] See p 253 below for a discussion of the wider 'spread' of sentiments.

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[1] See p 253 below for a discussion of the wider "spread" of sentiments.

Through this social interaction two instincts are being played upon, by some people and in some circumstances *submission* is evoked in him, but through obstruction and conflict he discovers other occasions and people against whom he may exercise *self-assertion* As he grows older, he achieves an increasingly delicate balance of these opposing propensities As he moves from nursery to school, lower school to high school, from thence perhaps to college, and finally into the wider world (though there is no finality in the process), he learns to ' find his level ' in successive environments He finds always some to whom he must submit, others over whom he may assert himself Thus he comes to judge of himself, and to form an *idea* of himself, through the reactions of his fellows towards him. In this way he builds up *self respect*, the normal form of *self regard* This is generally aided in its social moralization by some degree of *fear*, and by the operation of *active sympathy* which makes him anxious to be in harmony with his fellow men Such a sentiment, if deficient in the propensity to submission, may manifest itself merely as *pride* or *vanity*

The sentiment of self regard normally extends itself to clothes possessions, manual and intellectual productions, home, family (especially children), school, college, nation, church, and these extensions reinforce the sentiments of love which have also been developed towards them Witness the " touchiness " of a teacher towards any aspersions cast by others on her particular class in the school

SOME BLENDED OR SECONDARY EMOTIONS

This account of the genesis of sentiments presupposes the possibility of two or more primary emotions being simultaneously aroused, in fusion rather than by summation Any such blend habitually aroused may begin to form the nucleus of a sentiment.

Admiration is thus a blend of *wonder* and *subjection*, components well symbolized in the expression looking up to some one " We do not admire a work which is easily intelligible and imitable at our own level Very assertive or complacent persons are incapable of admiration for they will not suffer the humiliation of submission.

Awe is a blend of *admiration* and *fear*, and is experienced in its most common intensity before some overwhelming natural phenomenon such as the Victoria Falls, especially when it is regarded as a manifestation of supernatural power

Reverence arises when *gratitude* is added to *awe* *Gratitude* is the blending of *tender emotion* and *subjection* or negative self-feeling and is therefore an emotion which the self assertive resist, for as they say, "they cannot bear to receive a favour" or "to be under an obligation" Reverence is generally reserved for beneficent supernatural powers and their associated symbols It is the fundamental religious emotion whose dominant element is tender submission

These blends, with the exception perhaps of awe, are at the positive pole, and are likely to develop into forms of *love* in which self assertion will be lacking towards the object but possibly active on its behalf

At the other pole, and inclining towards the development of *hate*, is a group of complex emotions in which anger and fear are prominent constituents

Scorn involves *anger* and *disgust*, and often assertion or *positive self feeling*, with the implication that such things are beneath one.

Contempt arises when the object is deemed unworthy of anger, and *disgust* and *self-assertion* unite

Loathing and horror are a blending of *fear* and *disgust*, such as may be experienced towards a noxious beast or reptile, the addition of *wonder* at its "fearful symmetry" would produce a horrible *fascination*

THE DEVELOPMENT OF CONDUCT AND THE ORGANIZATION OF SENTIMENTS INTO CHARACTER

McDougall traces *four levels or stages of conduct* which form a useful framework for any theory of character development

1 A rudimentary stage, lacking in self-consciousness, when impulses result directly in action, modified only by the *pleasures or pains* which occur directly during their operation. Thus food seeking might conflict with fear where a savage dog guarded the orchard, the impulses of approach and flight might alternate, or fuse into a cautious approach The modifications are

concretely conditioned on the perceptual plane and do not require exercise of the imagination The animals act upon this level, in common with young children and imbeciles Rousseau's *natural consequences* are, however, too capricious and uneven in their operation to be effective guides to the highest levels

2 The social environment therefore normally intervenes with artificial *rewards and punishments*, and action is inhibited or favoured by presentation of these consequences, whether on the perceptual or on the ideational plane Some animals are also capable of modification of instinctive impulses upon this level, and are thus tamable Some sorts of human beings seem never to rise above it and are kept in check in the last event by the *arm of the law,"—these are the turbulent spirits who* find their outlet in a time of political anarchy

3 Crude rewards and penalties may next be replaced by the consideration of possible *social approval or disapproval, praise or blame* This social susceptibility has become operative only through the *self regarding sentiment*, the genesis of which has been traced It is this nice balance of submission and assertion, kept sensitive by fear and sympathy, which makes man so tenderly alive to public opinion But this level has its obvious limitations It is essentially egoistic, it would not operate in private, and it produces no stability of conduct, for there is likely to be a chameleon-like variability in each different environment, whether simultaneously or successively experienced, finally, its conservatism would make progress impossible, as is shown in Bantu kraal life where tribal custom is the highest tribunal

Yet this is a level above which many people, living satisfactory lives of a sort, never rise If the environment is good, its inadequacy will not be very apparent Probably every one remains on this level for a large area of conduct.

4. At the level beyond, an individual may become capable of *action from higher motives in line with his ideal*, irrespective of the opinions of his fellow men. To make this possible he must have developed *abstract moral sentiments* which would by their nature be of universal validity Moreover, these must have become more or less synthesized into an *ideal* towards the realization of which the self is motivated The genesis of the

abstract sentiments through the man's inner disposition and the outer influence of the social environment, with the cultural content of its social heritage, has already been discussed It remains to be seen how conduct in line with this ideal can become effective when, as in an extreme case, all the natural impulses and concrete sentiments are opposed to such action [1] Take the hypothetical case of a man in a good position as manager of a large firm, well to-do, respected, married, and the head of a growing family, whose social and educational requirements have been somewhat expensively conditioned Suppose that this man discovers that his firm habitually practises a type of "sharp-practice' which is opposed to his strong ideal of honesty, he protests, but is ridiculed and his scruples ' pooh poohed, until it is made clear to him that he must either conform to this usage or leave the firm Public opinion regards resignation as unnecessary and quixotic, his sentiments towards his wife and family are strongly opposed to such action, which will deprive them of the opportunities and advantages which they enjoy, and may even bring upon him their life-long complaints and reproaches, moreover, his departure will cover him with a disgrace which he must accept, for his tongue will in honour be tied and this will prevent subsequent appointment to any post of trust What motive power will suffice, and how will it operate, to produce action in line with this ideal of honesty and hatred of dishonesty, in face of so many opposing factors, public opinion included?

McDougall s answer is that, *in addition to a strong sentiment for self-control and the habit of acting in line with his ideal*, the man must be actuated by one of two motives (1) *An impulse aroused within the self regarding sentiment* will prevent him from forfeiting the approval of those living, departed, ideal, or supernatural beings who have become the "select gallery' whose opinion he most values He may think of such men as Chinese Gordon' and so on, what would they say if they knew?' [2] Though they might never know, the effect would be the same Note, however, that it is not for their sakes that he sacrifices himself but for self regard ' Moral advance and development of volition consist, then, in the improvement

[1] Not McDougall s own example [2] *Social Psychology* p 217

or refinement of the 'gallery before which we display our selves, and this refinement may be continued until the 'gallery becomes an ideal spectator or group of spectators, or, *in the last resort, one s own critical self standing as the representative of such spectators*'[1] (2) The second motive, cited as the highest in *Social Psychology* but apparently abandoned in the *Outline*, is that "our hero may decide on principle' "He has made up his mind after mature and cool deliberation. His self regarding sentiment demands that he shall live up to his ideal, he feels shame when he does not, elation and satisfaction when he does'[2]

Before discussing the acceptance or not of these explanations as furnishing the highest motives for conduct admittedly of the highest type of outward manifestation, it will be well to summarize McDougall s account of character in relation to this type of volition

CHARACTER AND WILL

In *Social Psychology* he writes 'One essential condition of strong character seems to be the organization of the sentiments in some harmonious system of hierarchy,' brought about by 'the predominance of some one sentiment that in all circumstances is capable of supplying a dominant motive'[3] (i.e. a master sentiment) First the impulses and emotions have been organized into sentiments, then these sentiments, concrete and abstract, have been organized, the lesser in subordination to the wider or more potent and in the fully integrated character all have been related to the ideal set up by the synthesis of the moral sentiments and principles There must also be a cultivated habit of action in line with sentiment or intention if the subject is not to be a 'sentimentalist. The fully integrated character will have every impulse and sentiment brought into subjection to its master motive, short of this there will be weakness, or the inconsistency of dissociated systems of sentiments, functioning more or less independently, a phenomenon which will be discussed in the next chapter The type of

[1] Op cit p 221 The italics are the writer's.
[2] Op cit., p 217
[3] *Social Psychology*, p 222

character depends upon the type of master-sentiment, as well as upon the systems within it and their degree of integration These systems may be few and limited, yet strongly dominated, so that a strong narrow character results, or they may be full, rich, but loosely knit, forming an interesting but unstable character That character is most to be admired which has a rich and complex array of sentiments, a wide and high ideal, self-discipline, and a worthy master-sentiment which will preserve the integrity of the structure at every point

The most satisfactory master sentiment is for McDougall, as has already been indicated, the *sentiment of self-regard* In *Social Psychology* he writes 'There is only one sentiment which by becoming the master sentiment can generate strong character in the fullest sense, and that is the self-regarding sentiment",[1] and in the *Outline* 'The self-assertive impulse is unique in that it is a motive of universal applicability, whereas every other motive is more or less restricted",[2] in *The Energies of Men*, however, he is content to leave the matter thus "The master-sentiment may be a love (or hatred) of any object, concrete or abstract, of God (of the good) or of the devil (of evil), of mankind in general, or of some individual, it may be a devotion to family or Church or country, or it may be a personal ambition, low or high *Whatever its nature, so long as it is so strong as to supply overmastering motives for all situations*, it will serve to form strong character and integrate the personality"[3] This seems a mitigation of the unrestricted, well-nigh lyrical praise of self-regard expressed in *Character and the Conduct of Life* "When developed under such guidance, self regard becomes the crown of the system of the sentiments, the fly-wheel of character, the regulator of conduct, the supreme arbiter in all moral deliberation, its desire to be and do the right thing becomes the decisive factor in all moral choice and true volition.' The essence of strong character is, then, that self regard shall be dominant, shall be the master-sentiment, while the qualities of the character are a function of the moral sentiments that are incorporated in the ideal The moral sentiments determine the qualities of character and conduct,

[1] *Social Psychology*, p 224 [2] *Outline of Psychology* p 445
[3] *The Energies of Men* p 305 The italics are the writer's

self regard secures to the impulses and desires that spring from them the right of way among conflicting impulses, and so gives consistency to conduct, makes character autonomous, enables it always to turn anew towards the lode-star of the ideal, to travel towards it always, even along the paths of greatest resistance And so, paradoxical as it may seem, strong self regard alone can enable a man, however disposed by nature to compassion and self sacrifice consistently to postpone his own good to that of others "[1]

It follows from this that *Will* is the ' outcome of character " " The Will is character in action.' [2] The most fully willed actions are those in accord with the whole personality, and the determining impulse is one aroused within the master sentiment or group of sentiments which dominate and integrate the character

This contention that self regard is the most effective master sentiment has met with considerable disagreement The element of self reference suggests a type of character which, as Ginsberg points out, may be 'narrow, unsympathetic and priggish, [3] and though McDougall has taken some pains to refute this charge, he has not succeeded in convincing religious writers concerned with a psychological analysis of the Christian ideal of character

Thus Professor L W Grensted writes "McDougall, by his stress upon the self regarding sentiment as the key to the development of the ego, has been led into an ethic of self sufficiency, closely akin to Stoicism, and utterly irreconcilable in principle with the Christian values ' [4] Later he quotes Dr Kirk as saying ' Sin may be said to begin with self regard,' [5] and discusses the ethic of self regard, 'this attractive modern Stoicism, as essentially opposed to the highest Christian conception, though he adds 'But in saying this we must not overlook the essential truth of the analysis upon which it all

Character and the Conduct of Life pp 65 67
[2] *Outline of Psychology* p 442
[3] *The Psychology of Society* Morris Ginsberg p 41
[4] *Psychology and God* Bampton Lectures for 1930, L. W Grensted p 31 to which a footnote adds "especially in his *Character and Conduct of Life*
[5] Op cit. p 136 from *Some Principles of Moral Theology* p 267

rests We may believe that the ideal depicted is not the highest and yet recognize that the whole process by which, in the long evolution of the human race, the individual has come to a dignity and a freedom of his own, and has attained in fact to the possibility of true moral choice and therewith of moral responsibility, is of the kind thus described, and plays a very necessary part in the evolution of the highest type of all' [1]

To quote another representative Christian book

> "Professor McDougall has, in a series of books, pointed out the immense importance in the formation of character of the 'sentiment of self regard' We cannot agree with him that it should be the governing, co-ordinating sentiment in a man s life such a view leads at best to a Stoical conception of human nature and its destiny A Christian s master-sentiment, as we have seen, will be the Christ-sentiment', and growth of Christian character consists in a growing, deepening fellowship with God in Christ But as to the importance, as a constituent part of his Christ-sentiment, of the Christian s sentiment of self regard—the whole group of ideas as to his own place and purpose in the scheme of things—there can of course be no question Perhaps the simplest way of expressing the truth is to say that the Christian s 'self regarding' sentiment should be a self naughting sentiment In other words, his thought of himself will be theocentric, not autocentric" [2]

To carry the discussion further would be to trespass upon the domains of ethics and theology The contention seems to be a question of which sentiment is the best *master* and best fitted to incorporate the other Might not the Christian exponents claim that the ultimate solution should be one of identification of the two sentiments? [3]

TEMPERAMENT AND TYPE

A distinction must be maintained between character and temperament, the former built up during the individual s

[1] Op cit. p 139
[2] *A Manual of Pastoral Psychology* L. Dewar and C. Hudson 1932 p 94
[3] Cf the Pauline declarations Galatians ii. 20 Colossians, iii. 3

lifetime, largely by voluntary acts, upon the basis of inherited propensities constituting disposition, the latter mainly the *result of natively determined factors of physical constitution*, though not without influence from environmental factors and the accidents of disease, and itself affecting the course of character development

From ancient times it has been recognized that the mind and personality are influenced by the working of the bodily organs, but whether mainly by the visceral and glandular system, or by the general muscular tone has been undecided Ancient and mediæval philosophers placed the emphasis upon the former, their four divisions into sanguine, melancholic, choleric, and phlegmatic were based upon the supposed amount and distribution of blood, bile and lymph Some moderns have pursued the study of endocrine gland secretions with a similar belief[1] Others are in search of some all pervading physiological trait, the influence of which upon the nervous system in general would account for corresponding mental characteristics, for example, there might be some general characteristic of body metabolism, or of synaptic resistance, which again might be due to chemical compounds in the blood, such as the hormones would supply

Whatever scientific explanations may or may not have been forthcoming, man has always been interested in the more or less acute analysis of his fellow-beings into types which he could label and pigeon hole, and where this has been done with literary skill, such types have always had their vogue

These descriptive classifications have tended to fall into two opposing types, whose successive delineations have borne a general resemblance to one another James[2] distinguished the man of *explosive* will from the man of *obstructed* will, attributing the differences either to excess or defect of impulsion or of inhibition Müller[3] isolated the trait of *perseveration*, and attempts have been made to divide people into *perseverators*, those who do not quickly switch from one mental activity to another, and *non-perseverators* or quick-switchers Stern,[4]

[1] Cf *The Glands Regulating Personality* L. Berman.
[2] *Principles of Psychology* James Vol. II Ch. XXVI
[3] Quoted *Abilities of Man* Spearman, Ch. IV [4] Quoted op cit.

working upon the type of reports of pictures given by his *Aussage* or Fidelity of Report testees, suggested an *objective* and a *subjective* type, the former merely reporting the actual, the latter giving personal impressions

But no such twofold type classification has been given such vogue as Jung s brilliant literary exposition of the *introvert* and the *extravert*[1] The general *attitude* of consciousness of the *extraverted* type is a positive relation to the object, he submits to a given state of affairs because his experience argues nothing else to be possible, his inner life succumbs to external necessity, his interest is primarily in the objective happenings of the immediate environment, he conforms to the generally valid view point, he owes his normality to his ability to fit into existing conditions with relative ease, he may neglect even the most obvious subjective factors, such as the condition of his own body, he is communicative and suggestible, and when he falls into neurosis it is usually some form of hysteria This conscious attitude is complicated by the *compensatory attitude of the unconscious*, which is introverted, but undeveloped, primitive, egocentric, regressive, the unconscious makes its need of achieving psychic equilibrium known in dreams, and in strange uprushes into consciousness, it is responsible for the unplanned things which happen to one, the blunders, the incomplete resolutions, the sudden tactlessnesses

The general attitude of consciousness of the *introverted* type is governed by subjective factors (such charges as " ego-centricity are the prejudice of extraverts), it is concerned with how the libido can be drawn from the object, as though an attempted ascendancy on the part of the object had to be continually frustrated, the personal and the collective unconscious play an important part But the *unconscious attitude* compensates by enhancing the influence of the object so that it may assume terrifying proportions in spite of conscious depreciation, and has to be surrounded with safeguards, and this is a great source of inner conflict The typical form of neurosis is of the repressed type characterized by sensitiveness exhaustion, dread of hostile influences and magical powers of outer objects

These distinctions become immensely complicated when

[1] *Psychological Types* Jung Ch. X.

Jung, doubting the pervasive unity of his formula, splits it again into four subdivisions, into *functions* reminiscent of the old faculties *thinking* and *feeling*, which form the *rational* types, *sensation* and *intuition*, which together form the *irrational* types They lend themselves to some charming subtleties of analysis, for example, of the *extraverted intuitive type* with "a keen nose for things in the bud pregnant with future promise,"[1] his eye constantly ranging for new possibilities, for whom 'stable conditions have an air of impending suffocation"[2]—the type of the successful speculator This is compared with the *introverted intuitive type*, the mystical dreamer and seer, or the fantastical crank or artist, with his "extraordinary aloofness from tangible reality'[3]

Temperament offers a wide and interesting, but difficult, field for experimentation Spearman[4] points out that separate unit traits can only be ascertained, described and measured by the method of correlation—that is, by discovering experimentally which traits vary concomitantly in any individual and so prove themselves to constitute wider unit traits

One such experimental attempt may be cited as having attracted a good deal of attention, although subsequent investigators seem to be finding its inter-correlations disappointing[5] Professor June Downey has drawn up a series of *Will Temperament Tests*, which involve handwriting reactions She accepts as her theoretical basis that Temperament shows itself in different patterns of activity, which are determined by (1) the amount of nervous energy at the individual's disposal, (2) the tendency of this energy either to discharge immediately through the effector organs, or to find an outlet by a roundabout pathway Hence she works with three groups of reaction traits (*a*) speed and ease, (*b*) forcefulness and decisiveness, and (*c*) carefulness and persistence, each group contains four specific tests[6]

[1] *Psychological Types* Jung p. 464
[2] Op cit p 464 [3] Op cit., p 508
[4] *Abilities of Man* Spearman pp 53 54
[5] Cf. Flora Kennedy's investigation reported *Jour Ed. Psych* Vol. IV, Pt 3 Nov 1934.
[6] *The Will Temperament and its Testing*, June E. Downey, 1924 pp 59-62

A second experimental approach has been made by McDougall,[1] working with a small windmill and recording the rapidity of the alternations (or flicker) in his subject's visual perception of the revolving arms The introvert experiences relatively *rapid* alternations, which he explains on the hypothesis of a comparatively *low synaptic resistance*, since they occur also in subjects stimulated by morphine, strychnine tea and coffee On the other hand, he finds indications that the *extravert* has a normally *higher synaptic resistance*, as seen in his slower alternations, and this retardation is also brought about by alcohol, opium and other drugs, and by fatigue The introvert can stand more alcohol than the extravert, but it has the effect of making him more extraverted (raising synaptic resistances) Moreover, the liability of the introvert to repressive neuroses, and of the extravert to hysteria, which is a malady of dissociation and therefore an outcome of *raised* synaptic resistance, seems to bear this out In the *Energies of Men*,[2] he suggests that, more physiologically, the introverts are those in whom the freedom of interplay between the neurone systems of the higher cortical levels strongly inhibits the direct outflow of energy from the affective centres of the lower brain, while the extraverts are those in whom those same energies flow out freely in the most direct efferent channels to muscles and viscera, being but little inhibited by the activities of the higher brain levels This antithesis between thought and action seems to be one manifestation of a very general principle of the energizing of organisms', namely, where energy is freely used in one kind of activity or function it is at the expense of other activities and functions, the latter are kept at a low level of energy-supply

Everything remains in the realm of hypothesis, but there is an immense practical field of investigation lying to hand here which might give results of enormous value to the educational and industrial worlds, beset by the interchange of references ' characters and testimonials, and the grave need for reliable vocational guides[3]

[1] *Outline of Abnormal Psychology* Ch XXVIII
[2] *Energies of Men* p 184
[3] The subject is treated in an interesting manner in *Talents and Temperaments* (1932) by Angus Macrae See especially Ch. IV

the environment through the perceptual-conscious system, it also embraces what is latent and capable of becoming conscious (called by Freud the *Preconscious*), but it merges below into the *Id* (from Latin, *id*, it), the unfathomed, interior, unconscious part of the personality which includes the instinctive driving forces and desires

One of Freud's most revolutionary doctrines is the attribution of sexuality to infants for he regards all contact pleasures from thumb-sucking onwards, as sexual gratification. Further, all social prohibitions, he maintains, are built up on frustrated desires Thus the strict laws against incest are an indication that *infantile sexuality* involves the *Œdipus Complex*,[1] that is, the falling in love with the parent of the opposite sex and the corresponding desire to kill the parent of the same sex. But these desires being *repressed* as the child develops, his dawning regard for the rival parent sets up an *ego-ideal* or *super-ego*, which becomes the censor of thought and conduct This *super-ego* reaches down into the *id* and is largely unconscious The unconscious primitive *id* strives for the *Pleasure Principle* and is totally non moral, it "stands for the untamed passions"[2] The *ego* has learnt the *Reality Principle* from its contact with the outer world through the perceptual conscious system, "it stands for reason and circumspection"[2] and strives to be moral and to impose the reality principle upon the id. The *super-ego* is often harshly hyper moral, and accounts for the sense of *guilt* which derives from these early unconscious repressions, and for the *resistance* which the analyst encounters when he endeavours to release the early repressed memories of the analysand The ego thus has a difficult task, for it 'serves three harsh masters the super-ego, the external world, the id.'[2]

The concept of equivalence or conservation of psychic energy is important for it issues in a theory of psychical determinism which would ascribe a psychological cause to every act, however insignificant or haphazard it may appear Freud has

[1] Not apparently confined to neurotics cf *Ego and the Id* p 43 'In my opinion it is advisable in general and quite especially where neurotics are concerned to assume the existence of the complete Œdipus complex"

[2] *New Introductory Lectures* p 102

implicit belief in motivation, conscious or unconscious If the psychic development is healthy and normal, there will be *progression* of the libido in its adaptation towards the demands of the environment, if there is at any point an unwise attachment or monopoly by parent or other person, there will be a *fixation* of the libido on the early love-object, if the demands of life become too difficult there may be *regression* to an earlier love-object, finally the censorship of the ego and super-ego will result in the *repression* of desires into the unconscious It has to be remembered that the ego itself may be a love-object, thus producing *Narcissism* (Narcissus was the youth in classical mythology who fell in love with his own reflection)

The neurotic is suffering from the disintegrating force of unfulfilled sexual wishes in conflict with the ego and super-ego Treatment is designed to reveal this conflict to the subject, to render the unconscious forces conscious, to bring the libido into line with the necessary social adjustments of life, and, by causing the patient to recall his experiences, real or phantastic, to release the dammed-up emotional energy, which is liable in the course of treatment to become temporarily transferred to the analyst.

Freud s teaching for the normal person may be summarized from several aspects

First, since according to Freud no action is undetermined, one may watch one's unguarded words and actions, especially slips of pen or tongue, absent-mindedness and so on, for indications of unconscious wishes In *The Psychopathology of Everyday Life*, Freud assembles a number of ingenious instances illustrative of this To quote from the more obvious A patient of Dr Brill,[1] writing to excuse himself from a difficult interview, regretted that "owing to *foreseen* circumstances he was unable to keep his appointment', the unconscious is always truthful

The slips which appear in typing and in the print of th popular press (which afford such scope for *Punch* comments) are judged to be of no less significance Thus, 'this *battle scared* veteran" was unhappily corrected to '*the bottle-scarred* veteran',[2] and a report by an opposition paper spoke of

[1] *The Psychopathology of Everyday Life* Freud p 130
[2] *Introductory Lectures*, Freud I p 24

"the honourable member for Central *Hell*," in place of *Hull*[1] Freud believes[2] that only the most select and well balanced minds are capable of perceiving external reality without distortion through the subjective bias Forgetting and absentmindedness are also considered to be seldom if ever insignificant accidents Thus bills are more easily mislaid than cheques and the lover rightly contends that there can be no satisfactory explanation of a forgotten tryst Even a sprained ankle must stand for some attempted *wish-fulfilment*, perhaps that for self punishment

Secondly, there follows from this the supreme importance of extending and strengthening the control of the conscious over the unconscious, especially by preventing fixations, regressions and repressions, through a released and healthy upbringing The child must not be shielded by too jealous a love, nor confronted by too difficult a life task The facts of sex must not be shrouded in a shameful obscurity, and it is perhaps especially in this changed attitude towards sex instruction of the young that Freud's influence upon education has made itself felt.

The two chief schools which have seceded from psychoanalysis proper are those of *Jung* and *Adler* Their main tenets can only be briefly summarized here

Dr C G Jung practises analysis at Zurich. He broke away from the pan-sexual interpretation of Freud, the *libido* for him is not necessarily sexual, it is "a complete X, a pure hypothesis"[3]

One of his best known contributions to psychology is his differentiation of *extravert and introvert types*,[4] whatever their ultimate value, Jung has usefully drawn the attention of analytic psychology to *individual differences* and the danger of working from a single formula

Another significant contribution is his theory of the *Collective Unconscious* racially inherited

[1] Op cit p 25

[2] *The Psychopathology of Everyday Life* Freud Ch X p 261

[3] *Contributions to Analytical Psychology* Jung p 33 (quoted from an earlier work)

[4] *Psychological Types* Jung, London 19-4

'In every individual," he writes, "in addition to the personal memories, there are also the great primordial images,' the inherited potentialities of human imagination The fact of this inheritance also explains the otherwise incredible phenomenon, that the matter and themes of legends are met with all the world over in identical forms' "The Collective Unconscious is the sediment of all the experience of the universe of all time, and is also an image of the universe that has been in process of formation for untold ages' [1]

Myths are thus the expression of this collective unconscious, and the whole of mythology but a kind of projection or externalization of it

Lastly, Jung has made much use of ' Word Association " for the treatment of his patients, and has thus made some alliance with experimental methods

Dr Alfred Adler gives the name of *Individual Psychology* to his school of analysis He lays the stress upon the *will to-power* as the prime motivating force [3] Hence the key to the understanding of the psyche is that it has as its objective the goal of superiority," so that the individual is guided in his life plan and spurred on to pursue it by the idea of his ' godlikeness," ' the belief in his special magical power '

This fiction, so ridiculous from the point of view of reality, ' is by no means harmless, for the craving for power introduces into life a hostile tendency which is at the root of aggressiveness and destroys the sense of co-operation Secondly, it causes an estrangement from reality, and *if taken seriously* compels the person to flee from real life and compromise by seeking a life within a life In other words he will flee the responsibilities and problems of life which are involved in his attitude towards (*a*) society, (*b*) vocation, (*c*) love He will put *distance* between himself and the undertaking in which he fears he will fail to prove his godlikeness,' by seeking refuge in ill health or some other neurotic symptom he creates the obstacle and then succumbs to it, reconciling his failure by constructing 'if clauses —'If

[1] Quoted *Outline of Abnormal Psychology* McDougall pp 193 194
[2] *Studies in Word Association* Jung
[3] *Individual Psychology* Adler (trans Radin) 1924

conditions had been different, what should I not ?", excuses which sometimes serve also to enhance such performance as he achieves To quote an example,[1] the neurotic hunger-strike almost peculiar to girls which sometimes develops at about seventeen years of age, is attributed to the unconscious rejection of the woman's rôle which may thus be brought about by retarding the development of the female bodily form.

Interesting deductions put forward by Adler are that such refusals of reality are affected by uncertainty during childhood of the nature of the sex rôle and its immutability, children, especially girls, should have this made plain[2] The under estimation of women has led to over-estimation of masculine traits, and both women, and men who fear effeminacy, are liable to a mastery impulse which he calls the *masculine protest* The meaning of this desire for power, both in boys and girls, is '*I want to be a man* His theory of *organ inferiority* and compensation is touched upon in the next chapter of this book. He has also developed a *position* psychology[3] concerned with the position of the child in the family, the eldest tends to conservatism, the second to aggression, the youngest to a sense of inferiority, or to over-compensation for this by effort

Adler's analytical technique has therefore the definite aim[4] of reinforcing the sense of reality and responsibility to the community by consciously overcoming the dangerous will to-power

A comparison of the *Dream Interpretation* of the three rival exponents will serve to clarify and summarize their differences

To Freud the dream is the expression of an unfulfilled, repressed, and usually sexual wish, rising out of the unconscious and clothing itself in the *symbolic* disguise of the *manifest content* drawn from the trivial incidents of the previous twenty four hours, in order to escape the censorship of the ego Its interpretation throws light on past wishes Thus, he argues,[5] when

[1] Op cit. Ch XVII p 212
[2] Op cit p 72 Ch. IX; and Ch. XXVI p. 324.
[3] Op cit. pp 321 322.
[4] Cf *Individual Psychology* Adler, p 15
[5] *Interpretation of Dreams*, Freud Ch. V p 211

the death of a relative is dreamt of with all the accompaniments of grief, it is no proof that the dreamer wishes him dead then, but that he has wished him dead at some time in childhood On the other hand, a lady [1] who dreamt of the death of a beloved nephew, Charles, really had an unconscious wish to meet again the professor whom she had met at a previous funeral, of her nephew Otto, at her sister's house

To Jung the dream is the exercise of the compensatory attitude and function of personality which in the daytime are too much disregarded owing to the dominance of the attitude and function prevailing in the conscious ego Thus the introvert gives rein in dreams to his unconscious extraversion, the thinking type to his repressed feeling, and so on, this reveals the need for the cultivation of the neglected function, so when McDougall dreams [2] of entertaining Lloyd George and attempting unsuccessfully to drive him in his car, Jung interprets this as the but partially successful effort of McDougall to cultivate his own *intuitive* function (symbolized by Lloyd George) which has been neglected for the *rational* function

The dream content often wears the allegorical dress of an archaic mode of thought, surviving from the collective unconscious But the meaning concerns the conflicts and difficulties of the present, sometimes of the next day [3] An educated man of middle age, fond of mountaineering, dreamt that after an at first laborious ascent he climbed with ease and exaltation until he floated off the summit into empty space, he refused to accept the interpretation of his dream, that owing to his unhappy private life he sought death in the mountains six months later he fell over a precipice and achieved it

For Adler the dream is more concerned with the future than with past or present It foreshadows the preparations which are being developed in the unconscious in connexion with actual difficulties encountered in the dreamer's life line Thus when Simonides [4] dreamt that "a dead person whom he had piously buried warned him from taking the contemplated journey,'

[1] Op cit Ch IV, pp 128 130
[2] *Outline of Abnormal Psychology* McDougall p 201
[3] *Contributions to Analytical Psychology* Jung p 327
[4] *Individual Psychology* Adler p 219

the safe-guarding purpose is obvious, for he could use this warning to frighten and so protect and excuse himself

So there is as yet no finality in dream interpretation!

Another distinguished worker in the field of psycho-therapy, and the most prominent figure in the French school, is *Professor Pierre Janet*, who has been especially active in the study of *hysteria* He connects it with the process of *dissociation* which, following emotional stress and subsequent exhaustion of mental energy, disintegrates the personality by separating off mental systems, small or large, from the main stream of integrated conscious personality In his work, *The Major Symptoms of Hysteria*, he examines these dissociated systems in all their forms, from small *tics* and *choreas* (all symbolic and significant movements), through *fugues* (as in the case of a young notary's clerk[1] who forgets his identity and goes off to Algeria only to recollect his identity by reading of his disappearance in the paper), to still more drastic cases of *dual personality* when two or more different personalities, each perhaps able to play the full rôle of life, may alternate for longer or shorter periods His treatment rests upon the conservation of energy, aided by deep hypnosis for the recovery of lost memories and their redintegration in consciousness It may be noted that he finds hysterical patients peculiarly susceptible to hypnotism

To mention some of the other work in this field *Dr J C Flügel* of London University, has developed the application of psycho-analysis to problems of the family and social grouping in *The Psycho-Analytic Study of the Family*, on Freudian lines

A number of practical and clinical workers are already applying an *eclectic* analysis and developing theories through experimental treatment without pledging allegiance to any school Among such are Dr Crichton Miller, of the Institute of Medical Psychology Dr Cyril Burt, who has worked with problem children of the London County Council schools, and such practitioners as Dr J A. Hadfield and Dr William Brown McDougall[2] would class himself with this eclectic school and names it "the school of integral psychology"

[1] *The Major Symptoms of Hysteria* Janet p 54

[2] *Outline of Abnormal Psychology* McDougall Ch. I, p 24 (footnote).

Psycho-analysis has already profoundly modified the treatment of abnormal patients, stressing, as it does, the psychic or functional, rather than the physical and organic, factors

It has made vast incursions into educational theory and practice, especially through the instrumentality of the New Education Fellowship, by means of its experimental schools and of its propaganda through *The New Era* publication and through international conferences It has naturally been especially concerned with the treatment of *problem children* Special techniques of *child-analysis* have been developed by Melanie Klein [1] and by Anna Freud [2] The latter sums up the contribution of psycho-analysis to child-education up to the present time under three heads, namely as offering a criticism of existing educational methods, as providing the teacher with a better understanding of human nature and of the relations which exist between the child and the educator, and as helping by child-analysis to repair some of the damage inflicted upon individual children during the educational process

B

SOME CONCEPTS APPLICABLE TO EDUCATIONAL PRACTICE

It will be useful now to consider those aspects of psycho-analytical theory which may seem especially relevant to the teacher s task. The general teacher is not concerned practically with the special techniques used by the analyst for remedial treatment, such as free association, word association, dream interpretation, adjustment through transference, and so on These will be the concern of the psycho-educational clinic where one exists It is the emphatic belief of psycho-analysts that no one should attempt to analyse another who has not himself been analysed The teacher s task will be prophylactic, that is *to prevent maladjustment* by the provision of sound training and opportunity, and even by the smoothing out of such kinks as can be seen in embryo in many a normal child Much of his

[1] Described in *The Psycho-analysis of Children* Melanie Klein trans A. Strachey London 1932

[2] *Introduction to Psycho-analysis for Teachers* Anna Freud trans Barbara Low, 1931 p 104

success will depend upon his own freedom from .. and the recognition of and allowances for his own biases

The student is now in a position to appreciate that the ... lems of character development will concern the *development direction*, and *synthesis* of the impulses and emotions, the orectic or conative affective tendencies, be they called or propensities

1 The problem of *right development* is concerned with avoidance of two kinds of maldevelopment (*a*) ment or defect, (*b*) over-development or excess

2 The problem of *right direction* is concerned with (*a*) avoidance of wrong direction or *perversion*, (*b*) the provision of right direction either through the *normal biological channels*, or where these are unavailable, inadequate, or inadvisable, through *social sublimations*

3 The problem of *synthesis* is concerned with (*a*) the avoidance of *conflicts* which result in stultifying *repressions* or in *dissociations* which weaken by separating into water tight compartments (*b*) the guidance towards a *master-sentiment* or motive satisfactory to the character and capable of dominating it.

A brief account of the various 'mechanisms" involved in these possibilities will be attempted before passing on to their application in the next chapter to some specific aspects of the development of the self

1 (*a*) *Emotional defect* may be due to lack of opportunity for exercise as for example in the child who, brought up in an institution with other children of his own age and with no pets to look after, has deficient exercise of tender emotion which seems to *atrophy* by the law of disuse More usually, however, in such a case there will be *repression*, that is the child will attempt to express such emotion but will find it in *conflict* with the public opinion, ridiculed or forbidden, so that the energy will remain pent up, or compensated for in other and perhaps morbid ways Herein lies the importance of the concept of *psychic energy* Such energy has been variously conceived by hormic and psycho-analytic psychologists either as a general reservoir from which all the instincts draw their force, or as contained in separate tanks each serving some special "instinct", or, combining these concepts, the tanks are regarded

as opening into and drawing upon a common reservoir In any case the energy is regarded as being made available through "instinctive' channels Thus a failure, as it were, to turn on the taps, will lead to a poverty of energy in the conscious life, manifesting itself in lethargic conduct and in weak, colourless sentiments and character Meanwhile, in the case of repression through conflict, the energy will probably be strengthening the unconscious systems (or *complexes* to be described later) and rendering them more liable to uncontrollable explosions into the conscious, or to dissociation

1 (*b*) *Emotional excess*—Emotion is characterized by Ribot[1] as *morbid* when (i) its physiological concomitants present themselves with extraordinary intensity, (ii) when it takes place without sufficient determining cause, (iii) when its effects are unreasonably prolonged,—either the shock effects, or the subvening mood Such morbid excess would, for example, be seen in fear which rendered a child white, trembling, and gastrically deranged, which broke out at every unexpected sound or movement, and which was prolonged into night terrors The danger here lies in the physical ill-effects of visceral disturbance, the draining of energy from the other, neglected psychic systems and the consequent production of emotional exhaustion and liability to dissociation and hysteria

2 (*a*) *Perversion* is misdirection of emotional energy to an unsuitable object, either through the *association* of the latter with the true object, or through the *regression* of the energy to a previous ' fixation " point where it tends to attach itself to an earlier object which should have been left behind The word perversion is usually applied to misdirection of the sex-impulse, in the form known as *fetichism*, any object under the sun may become a sexual excitant

2 (*b*) *Sublimation*—' We believe," says Freud, " that civilization has been built up, under the pressure of the struggle for existence, by sacrifices in gratification of the primitive impulses, and that it is to a great extent for ever being re-created, as each individual, successively joining the community, repeats the sacrifice of his instinctive pleasures for the common good ' [2]

[1] *The Psychology of the Emotions* Ribot pp 62-63
[2] *Introductory Lectures* Freud Ch. I p 17

With the growing complexity of society it must become less and less possible for the instincts to find their natural biological satisfactions at every stage as they do in the animal world, and in a large manner in the life of primitive man. This is especially so, for example, with the sex instinct, when the marriage age becomes steadily higher, and other outlets for the instinct have to be sought in creative occupations Hadfield supplies the following definition "Sublimation is the process by which instinctive emotions are diverted from their original ends and redirected to purposes satisfying to the individual and of value to the community"[1] The important point is the fulfilment of these last two conditions The man who finds his sublimation in music cannot force his solution upon the unmusical man who finds himself drawn to painting, yet the daubing of atrocities intolerable to the cultural level of his own society would be no sublimation

3 (*a*) *Conflict* is a concept indispensable to the psycho-analytic outlook, for every neurosis is regarded as the outcome of a conflict within the psyche. It is not a case here of the normal conflict of motives, which, whether on the lower level between sporadic impulses, or on the more developed level between such impulses organized into sentiments, functions consciously and requires conscious *suppression* of the rejected motive, such conflicts may be severe and exhausting, but have nothing morbid about them Often, however, one or both of the conflicting motives or wishes are disguised from consciousness, so that the conflict takes place more or less subconsciously, and does not come into the daylight. That is, the opposing desire is *repressed* by the self regarding sentiment, the Ego, or Ego-ideal, while this exhausts energy in trying to hold it in check, often over a long period

Such repressed desires tend to aggregate energy unto themselves and to build up unconscious structural systems comparable with the sentiments of the conscious life These constellations unacceptable to the conscious self, are known as *complexes* Physiologically speaking, they probably affect wide groups of neurone-systems, forming in the last event a hierarchy of complexes, a subconscious or co-conscious self Here then is

[1] *Psychology and Morals* J A. Hadfield p 152.

dissociation of personality, a division of forces in small or large degree, and a consequent diminution of energy in the main conscious stream The hypothesis is that the high nerve tension in the charged neurone-system finally raises such a resistance in the synapses between itself and the other depleted systems, that these, often in sleep, suddenly become impassable The *extreme point is illustrated in Morton Prince's remarkable study*[1] of Miss Beauchamp " who suddenly left her life as a nurse, and was, when he came into touch with her, a college student of gentle disposition and indifferent health, with no recollection of her more robust nursing personality, and with a third mischievous personality, Sally, incubated from childhood, as well as several other less distinctive ' selves ' , the extraordinary pranks, quarrels and alternations between this caste make as interesting reading as any fictitious drama Its normal counterpart is found in the man of the business, home, club, sports, and perhaps, Sunday, " selves," all more or less clearly differentiated

3 (*b*) The question of the *normal synthesis of character* and the need and choice of a *master-sentiment* has already been fully dealt with in Chapter V It may, however, be advisable to touch upon some of the ways in which the morbid or unacceptable sentiments known as complexes may be detected and dealt with, since these it is which complicate the task of the self most drastically in its efforts to attain mastery and unification

Buried motives usually disguise themselves to the self, and so, if possible, to others, by a mechanism known as *rationalization*, that is, the subject, ignorant of his motive, invents one which is satisfactory to himself, and which would perhaps have been an excellent one if he had thought of it beforehand It is more than the proverbial excuse because it deceives the excuser, usually casting a favourable light upon his action, as when the managing and interfering person considers himself as unselfishly actuated for another's own good

There are, however, definite ways in which repressed impulses and complexes do reveal themselves to the conscious mind, dreams, and slips of tongue and pen, and accidents of all kinds have already been mentioned, to them must be added habits

[1] *The Dissociation of a Personality* Morton Prince 1906.

CHAPTER VII

THE DEVELOPMENT OF THE SELF IN RELATION TO (A) AUTHORITY, (B) SOCIETY

NONE of the aspects of development about to be treated is in any way independent of the rest, all are dovetailed into the structure of character and personality, whether this or that trait should be treated in relation to authority, society, sex or reality, is often a matter of arbitrary decision in the interests of lucidity

A

The development of the self in relation to authority is the dominant theme of Adler, who regards the will to-power as more fundamental than the sex motive, thus reversing Freud's view This is akin to McDougall's insistence upon the dual importance of the assertive and submissive propensities which, becoming balanced in the organization of the self regarding sentiment, furnish the key to personal development Certainly there is no more central theme for educational consideration than this question of the right interaction between compliance and authority, a problem of the teacher's adjustment no less than of the child's.

In *The New Psychology and the Teacher*, Crichton Miller writes "There are roughly two aspects of education the one, the transmission of racial experience, the other, the development of the individual psyche"[1] In the past the former aim has predominated, and it has been the function of authority to hand on 'culture' to the immature recipient under such constraint as his welfare required The modern era is beginning to lay the stress upon the latter aim and to talk

[1] *The New Psychology and the Teacher* Crichton Miller p 27

about "child-centred" schools, and in so doing it claims some remarkable successes in the indirect fulfilment of the former

The educator who aims at individual development is at once brought up against two great tensions in the personalities of himself and of his pupils—the urge to self-assertion and the urge to submission. The psycho-analysts have treated the first under various forms, such as the mastery-impulse, the will-to-power, the desire for freedom, life, responsibility or independence, and the second generally as a negative and distorted form of the first—the desire to retreat from responsibility, to flee reality and remain a child, to return, as Freud puts it, to the security of the mother's womb, to wish for death

These two reactions are necessarily ambivalent, a *defect* of one will cause an *excess* of the other and vice versa, and every form of conflict and alternation may occur *Excessive assertion* will produce pride, vanity and rebelliousness *Excessive submission* will cause ultra-suggestibility, lack of tone and vigour, and the failure to achieve a free well adjusted personality

The common *perversions of assertion* are seen in the everyday "naughtinesses' of the classroom, against which the old regime was especially directed The perversion of *self-display*, which in its extreme form mingled with sexuality is known as *exhibitionism*, betrays itself in showing-off, calling out,' asking unnecessary questions, baiting the teacher, and other efforts to secure attention, which may effectively result in hearing one s own name reiterated, in being stood out, perhaps even in front by the inexperienced teacher, or in the 'enduring hero' situation provided by corporal punishment The perversion of *aggressiveness* which includes pugnacity, and is often complicated by a sexual element which desires to see a loved object suffer and is then known as *sadism*, shows itself in the bullying of weaker children, often with an accompaniment of loud, disturbing outbursts

The analysts explain this desire for attention and assertion as a craving for love, such 'naughtiness' may arise from a starved home-life, as for example when mother love is lacking, or when the child feels neglected or of no interest to anyone Constance Long[1] cites the case of an orphan girl of 17 who became

[1] *Psychology of Phantasy* C. Long p 5..

unbearable at school after the death of a beloved aunt who had brought her up, here sexual fears mingled with deprivation of love were finding an outlet in insubordination. The child revels in the emotional disturbance created, and would rather have the contact of a scolding or a whipping than feel ignored or uncared for.

Perverted self-abasement may also manifest itself in various forms and in various alliances. Popular speech makes much play with the *inferiority-complex*. Adler explains it thus: "The impulsive life of man suffers variations and contortions, curtailments and exaggerations, *relative to the kind and degree of its aggressive power*," or preferably, relative to the way the power of co-operation has developed in childhood.[1] It is thus rather the repercussion of maladjusted assertion than the crown of humility. In Adler's view, the special determinants to a sense of inferiority are (i) *organ inferiority*, that is, the defective development of any physical or mental trait, including not only such definite inferiorities as deafness, a limp, inability to sing or to calculate, but also the general inadequacy of the whole human race which he describes as "blessed with deficient organs, deficient for coping with nature";[2] (ii) *position in the family*, the youngest being the most liable to a sense of inferiority, and (iii) *femininity*, whether of actual physical constitution, or of disposition and appearance in the male. It is, he claims, the *pampered* and the *hated* children who suffer most from a sense of inferiority. One morbid outcome may be the development of a *neurotic symptom* which may be a definite physical malady such as asthma, headache, digestive disturbance, fits or fainting. This *flight into disease* is not only a flight from reality, it also secures all the attention and interest which the ego claims in compensation, and gives dominance over the other members of the household. In normal life, the inferiority complex, which is thus an expression of thwarted urge to power, shows itself in an outward depreciation of the self which is resented when it comes from others, and an outward flattery of others which suffers the warp of an inward detraction. A further morbidity which Freud relates to sexual gratification is

[1] *Psychologies of 1930*, p. 395.   [2] Op. cit., p. 398.

the desire to suffer pain, mental or bodily, at the hands of the self or of others, a perversion known as *masochism*

It has thus become plain that aberrations of the propensities to assertion and submission may do great harm to the personality The deliberate evocation and direction of both in the impression able years of life are in the hands of parents and teachers, so that it is of vital importance that they should think clearly in regard to them One of the crude popular results of the New Psychology" has been the suspicion which has fallen upon all discipline, as though the solution could be met by a negative Dr Cyril Burt,[1] in his monumental investigation into the causes of juvenile delinquency, based upon 200 delinquent cases and a control group of 400 non-delinquents, places first among the fifteen conditions which he finds most prevalent among the delinquents, that of *defective discipline*

> Such features are encountered five times as often with delinquent as with non delinquent children Home discipline may be too strict, too lenient, or virtually non existent Over strictness was reported in 10 per cent of my cases Even commoner is a discipline too weak and easy going It is reported in one case out of every four'[2]

Too strict discipline is not a great fashion of the day, but it may still be seen in a type of authoritative parent or teacher whose own complexes have been unresolved Those who have been harshly or sternly brought up themselves are liable to visit it upon their juniors on the rationalization that what produced so much good in them must do so in others Psycho-analysts see retaliation here, these adults are jealously depriving others of the happiness of which they were deprived It is noticeable that where there is harsh, aggressive discipline at the head of a family or institution, such as a hospital or a school, it is reflected at every level of the hierarchy, and every one who has been abased by his senior takes it out' of his junior, in such a school the bigger children usually bully the smaller

The harshness of male parent and teacher is liable to take the form of angry outbursts or physical violence, in the female

[1] *The Young Delinquent* Burt. [2] Op cit., pp 96-97

of nagging, bickering, petty restrictions and constant irritability Mental ill-treatment may be even more harmful to children than physical, the ridiculing, shaming before others, the subtle searching out of the child's most sensitive spot, and the constant probing of this by sarcasm and innuendo can be more cruel than bodily injury

No doubt much rationalized unkindness has its unconscious motives of retaliation, sadism and the sexual jealousy of age for youth Yet it would be a mistake to attribute all the fault to the starved love-life of teachers, even of unmarried women teachers, though much of the trouble may arise from this, among other repressions Fear of the principal, or of disorder from the class, extended self regard which desires good examination results, self assertion which craves for a reputation as a disciplinarian, or which cannot bear to be thwarted by juniors, all these may be contributory factors Nor must the natural and understandable factor of fatigue be forgotten, not only does the harassed, over worked mother, suffering the recurrent trials of child bearing, find the noise and liveliness of free child hood more than she can stand at times, but the teacher confronted daily by 25 to 50 restless spirits, nightly by the correction of their literary productions, and termly by an overwhelming examination accumulation, is apt to adopt measures of self-protection which do not find their justification in regard for the children's development [1] The older type of teacher added the strain of trying to maintain a fiction of infallibility

The effect of violence upon the more vigorous spirits is often an aggressive insubordination, either direct, or issuing indirectly in some daring breach of law The response to nagging is usually sulking and bad temper, and often the seeking of forbidden satisfactions Both reactions generally include deceit and double-dealing Such attitudes do not restrict themselves to the representative of authority concerned, they have an enormous ' carry-over McDougall would see in the "anti authority complex a conscious, explicable sentiment of hatred for authority Psycho-analysts describe this as set up by threats of paternal displeasure, and reinforced by racial phantasies

[1] Long s *Psychology of Phantasy* Ch. IV, is helpful here.

operating unconsciously [1] In any case, the antagonistic attitude is carried over to all subsequent authority—teacher, minister, employer, state and finally the Deity Boys seem more liable than girls to this form of maladjustment, which often produces wasters who cannot keep a job, or active enemies of society

But what of the 25 per cent who suffer from too little discipline, who have never been made to submit to authority of elders, and who have learned to play upon their weaknesses for the supply of every whim? Such laxity may be the result of circumstances, a father dead or away from home, aged grandparents in charge, delicate or preoccupied parents, or parents mentally dull, over-emotional, or, worst of all, capricious or at variance Sentimentality or a hypochondriacal atmosphere may make the child the centre of his world This is most liable to happen if he is "delicate" and the doctor has said he must not be upset or punished Handicapped children are often much more handicapped by this mistaken kindness, the case may be quoted of a semi blind boy who had had everything done for him and could not bear to be crossed, with the result that, when at 9 years old he went to a special school, he had developed no resources whatever, and was unable even to turn on a tap for himself The genuine spoilt child has never had a healthy submission evoked in him, he has come up against nothing which stands firm against personal wheedling or storming, he becomes incapable of admiration, gratitude, respect or reverence, with their component of negative self feeling For him there is no law, only whim Burt has shown how in such cases the turning-point may come with one parental chastisement which contradicts the assumption that every authority is manageable when one knows how

The discipline which is capricious, either successively in the same parent, or simultaneously between the two parents, prevents the child from forming any just estimate of himself—assertion and submission have no moral equivalents, and not only is the self regarding sentiment distorted, but the moral ideal is also hindered The emotional accompaniments which usually complicate these situations also have their harmful repercussions upon the development of love-sentiments, one

[1] Cf *Contributions to Analytical Psychology* Jung pp 123 124.

person is played off against another The whole situation makes for instability of character and purpose

No less harmful is the *absence* of training and discipline Burt declares 'of all forms of neglect, moral neglect is the most fatal", the child feels himself unwanted and unloved, and will usually take his revenge upon society

It is worth noting that the chief modern remedy for the *problem child* is the abrogation of external discipline The old type of reformatory sought to tighten up the coercion in the hope that right habits would be engendered by lack of opportunity for wrong But the emphasis nowadays is upon the emotional sentiment to be formed rather than upon external repetition of enforced action Of the repressed type of delinquent, Burt writes 'The ideal discipline is no discipline at all",[1] and of many of the unrepressed, "No sooner is the restraint lifted boldly away than their aggressive behaviour ceases",[2] and again, 'As a general principle, rules, taboos, injunctions, and efforts at compulsion of whatever kind, should be reduced to a minimum' The child has, as the behaviourists would say, to uncondition his reaction to authority, and then recondition it, the aim being to build up an inner discipline which the self understands and accepts Some interesting experiments have been attempted in this direction, three of which may be cited here Homer Lane carried on his 'Little Commonwealth' in Dorsetshire as a certified reformatory on free lines, A S Neill runs a free school for the problem children of the well to-do, Miss M A Payne has given in *Oliver Untrusted* a pseudo-fictitious account of an actual attempt to reform a large Poor Law orphanage on modern lines

(1) Homer Lane,[3] in a chapter called The Sham Authority and the Real, describes how he took over the custody of a boy of 15 years, a truant and burglar, alluded to by the magistrate as a confirmed young ruffian He and Tim and Tim's mother, a poor, care-worn, weeping little woman numbed with misery retired to an ante-room, and Tim steeling himself against his mother's grief, glared antagonistically at 'the loathed representative of authority

[1] *The Young Delinquent* Burt p 519 [2] Op cit p 520
[3] *Talks to Parents and Teachers*, Homer Lane Ch. III

I determined,' writes Lane, 'to aim a shrewd blow at those feelings of defiance and hatred which had been accumulating in his mind for years, in order to teach him who was his master and what obedience is   Look here, old man,' said I briskly, 'Take your mother home and come down to the school to-morrow'"

And with a few brief directions about trains, he handed him a sovereign and turned on his heel As he did so he heard a changed tender voice say, ' Come on, Mum ! and saw him put his arm through hers and draw her toward the door '

(2) Neill[1] writes in *The Problem Child*

'I think of one of my failures   A Slav girl of thirteen was sent to me She hated her father intensely For six months that girl made my school life a little hell   She was a power person with a tremendous ego When she left (I had to tell her mother that I could not cure her) I shook hands with her   Well, I said pleasantly, I didn t help you much, did I?' 'Do you know why?' she said, with a dry smile 'I ll tell you The first day I came to your school I was making a box, and you said I was using too many nails From that moment I knew you were just like every other schoolmaster in the world—a boss From that moment you could not possibly help me' 'You are right, I said, 'Good-bye'"

(3) M A. Payne[2] describes the difficulty of remodelling an institution built up on a long-established martinet tradition, and relates the first chaotic effects

'Another girl, determined to create a sensation, climbed out on to the window sill, over a 40-feet drop, and said she was going to fling herself down because no one loved her The Housemother, with great presence of mind, finished preparing the babies food, and then walked out of the kitchen and shut the door   The girl, on finding that she could not get the sensation she needed, climbed in again and said she had thought better of it No one ever alluded to the matter with the girl but all tried to make her feel she was loved and wanted, only in a sane, unemotional way After a year of the freedom system, the Matron ceased to have these

[1] *The Problem Child* A. S Neill, p 84
[2] *Oliver Untwisted* M A. Payne p 42

interesting, but rather nerve-straining incidents with the older girls They were trusted to go out alone, believed, but most important of all, they were made to feel they were as good as and wanted as much as anyone else '

If these examples seem extreme, it has to be remembered that they are dealing not with the normal child, but with cases already badly in need of remedial treatment. Yet the principles which they illustrate are advocated by the new educationists as holding true for both normal and abnormal children however quantitatively different their requirements may be. The solution lies not in the negative removal of discipline There are three main positive factors involved which will be briefly considered (a) The devoted and self-regardless adult, (b) the ordered, settled environment provided by the same or like minded authority, (c) the opportunity for successful achievement and self-expression

(a) The ordinary layman is wont to accuse the "free education reformer of achieving his success by virtue of his personality, an allegation which the latter indignantly repudiates, for surely his aim is to eliminate personal impressionism and the impact of the adult personality upon the immature The truth is, as Dr Susan Isaacs [1] has shown,

"an adult who is there with the children cannot divest himself of his parental authority by an act of his own will and create conditions so free that they rule out his prestige as an adult It is not what we are to ourselves and in our own intention that matters, but what the children make of us Our real behaviour to them, and the actual conditions we create, are always *for them* set in the matrix of their own phantasies And what they do make of us in the years from two onwards is in large part a function of the already highly complex interplay of infantile love and hate impulses, and anxiety reactions towards these The intensive study of instinct and phantasy in individual children by the technique of psycho-analysis has shown that, even at this early age, guilt and anxiety and love invest any adult who has an active relation with the children with a prestige he cannot escape Whether he will or no, he is drawn into the ambit of the child's intra-

[1] *Intellectual Growth in Young Children*, Susan Isaacs pp 8-9

psychical conflict. The children are psychologically orientated towards him as adult Their world hangs upon him, and his slightest sign is full of meaning '

A neutral non interference will achieve nothing but the production of more destructive behaviour and mental distress For the adult educator takes the place of the parent

" And if the parent is passive, one of two things happens, either the child believes that the grown up *endorses* what he is doing, or he suffers internally from the tension of guilt which fails to find relief in his being told what he must *not* do, a tension which issues sooner or later in actions aimed at provoking anger and punishment ' [1]

Describing her own experience at the Malting House School at Cambridge, Dr Isaacs [2] says

" In the first few days of the school, when I had ten or twelve very difficult and boisterous boys between two-and a half and five years, I was too passive in my treatment of situations of bullying and cruelty, in the hope that if the bullying elders were not interfered with, that is to say, received no bullying ' from me, the impulse would die a natural death

But she goes on to explain

" If the adult in charge does not accept the function of super-ego, she (*sic*) necessarily and automatically becomes to the child the representative of his own bad aggressive self Within a few weeks after the beginning of my experiment therefore, I ceased to remain passive in such situations I interfered to prevent actual bullying, and showed that I disapproved of it, but without strong moral reproaches and without, in my turn, being aggressive to the bullies, that is to say, without doing to them what they had wanted to do to the younger children, without fulfilling their phantasies of talion punishment It was not only the younger children who were now saved from teasing or interference and became more contented but also the elder, stronger children who now felt safeguarded against their own impulses Young children do need to feel that the adults around them are

[1] Op cit p 9
[2] *Social Development in Young Children* Susan Isaacs pp 422 423

stronger than themselves and represent, not the forces of destruction, but those of ordered creation There are times with every child when he needs to feel that he can be *made* to do things, that those whom he loves are not at the mercy of his own ungovernable instincts, but are firmer and stronger and more reliable than he ' [1]

The adult who thus takes up the task out of love places himself at the child's disposal to be the representative that he *needs for the building up of his own super-ego ideal, or con* science, and he is content to make no personal demands which conflict with this, which argues a high degree of freedom from complexes of his own, such as give rise to inordinate love or power demands In the case of problem-children, or those who have already suffered wrong orientation from adults he is content to be invested with the hatred affects earned by his *prototypes in the child s psyche, in order that by his patience* and consistency he may convert these into love affects which may be carried on through life, so that they colour not merely the subject s attitude towards other individuals, but his outlook upon the whole world fabric of society That is why the first requirement of a new educator " is a highly self-disciplined love devoid of all sentimentality and untainted by an inner *deprivation which craves for reciprocity*

(*b*) Given such a personality in charge, the second requirement of a settled framework of control and routine ' [1] follows naturally One of the most disintegrating conditions for youthful development is an unstable background and environ ment which give the child an uneasy and often *indefinable* sense of insecurity The mere fact that whatever his own difficulties or shortcomings, the home or school goes on,—work, rest, meals retain their sequence, in other words, the foundations stand —is an immense safeguard to the child against his own fear of life and general sense of anxiety

(*c*) The importance of the positive need for expression and *achievement in the world of reality,* with *its* own inherent discipline, is well described by Crichton Miller,[2] who writes

[1] Op cit., p 421
[2] *The New Psychology and the Teacher* Crichton Miller, p 219

"The urge to achievement is the progressive side of the striving after power The repressive side of it is the lure of attracting attention and creating an effect upon people "The complete triumph over this desire consists in the readiness to be ignored 'The boy who from his earliest years has been surrounded by opportunities for achievement, who has been neither crushed nor adored at home, who has never known what it is to have his interest dammed back, and to feel shut in upon himself, to whom work and play have much the same value as possibilities for achievement, such a boy rarely, if ever, needs to find his level, and be taught to think less of himself"

The negative removal of discipline will not in itself be effective 'unless it is associated with a really infectious spirit of achievement, which automatically brings in its train a reconciliation to self mastery"

The achievements which offer the most wholesome scope are the mastery over the *forces of nature*, and *creative achievement*

Children s assertion should be pitted against things and not against people Burt[1] quotes from Rousseau 'So long as children find resistance not in human wills, but only in things they will never become rebellious or choleric Gardening rowing, sailing, rearing pets, cooking, mechanics, and all the pursuits of applied science, offer their own discipline and if their mastery is of personal interest to the child, he or she will spare neither time nor pains to understand and to conquer their conditions In the same way creative work chosen according to his own line of expression will make its own exacting demands In both these struggles for achievement, he will value co-operation and he will appreciate the work of the expert The parent or teacher who can put him on the track of discovery, recommend the sources of information admit when he does not know, strive alongside him but never super impose his handiwork, nor set a task as an exercise to come out to a standardized pattern of his own, but rather allow the child to knock his head against inherent, objective forces and requirements, such an one will never provoke resistance to authority He is unconsciously manifesting the value of co-operation Moreover,

[1] *The Young Delinquent* Burt p 521, footnote.

his own aggressiveness runs no danger, and he fears no outbreak of forces which he is repressing He will no longer be asking questions to try to catch the boy out, nor will the boy be questioning him to find out what he does not know, the boy will only ask what he wants to know, when he wants to know it, and he will have confidence that no more will be told him.

Where self activity methods have been given a fair chance they claim to master a curriculum beyond the power of the old methods Lay[1] has some interesting strictures on the extraordinarily small amount which the average pupil learns in school and college owing to his unconscious resistances[2]

> "It is a well known fact," he writes,[3] with characteristic absoluteness, that the amount of conscious mental activity necessary to graduate from any school or college is comparatively small, and is easily accomplished by some persons, who are free from the inhibitions so common to all others, in half to three-quarters of the time usually taken ' There is no reason why all boys and girls of a certain grade of maturity should not do all the preparation for college in one year instead of four, if they were willing to do it The actual procedure in a so-called recitation is a method of the most dreary slowness compared with the vivacity with which the individuals composing the class attack problems no less intellectual, when they understand the importance and vitality of the subjects for their own lives '

Where every one is doing what he believes to be worth while for its own sake, and not from imposition either slavishly or rebelliously accepted, his own experience will teach him to balance the elation of achievement with the subjection brought about by the immutability of natural laws, the refractoriness of matter, and the discrepancy between ideal and actuality Thus assertion and submission will achieve a healthy synthesis, and there will be a true admiration for the perfect mastery It is not to be supposed that the ideal environment for this exercise will be as easy for education departments to provide as was that required for the verbal transmission of culture,

[1] *The Child's Unconscious Mind* W Lay
[2] Plus, he admits the retardation which comes from large classes in which the slowest sets the pace.
[3] *Op cit* p 233

apart from increased expense for equipment, the primary requirement will always be the right type of personality to carry on the task with both patience and initiative But the change has begun, and will surely and slowly develop

B

THE DEVELOPMENT OF THE SELF IN RELATION TO SOCIETY

In the present days of experimentation in popular governments, there is no more interesting study for the psychologist than that of social psychology, to which men are looking for some guidance in the development of that co-operative spirit for which they crave in ideal if not in practice Sir Martin Conway [1] has pithily said that the despotism of kings has been tried and limited by experience, now the despotism of crowds is on trial and a similar experience is arising in relation to them " Trotter,[2] in common with le Bon [3] and others, has laid stress upon the degenerating effects of crowd mentality, the over-suggestibility, unbalanced emotionalism, and dethronement of rational thought which characterize men in the mass

Group sentiment, such as belongs to an organized body, is a much more complicated social development than the mere propensity to gregariousness which but serves to bring people together In *The Group Mind* [4] McDougall has consistently developed his theories as applied to national and other groups Two prominent propensities in such a group sentiment are those of self assertion and submission, allied with primitive passive and active sympathy, fear and pugnacity may also play their part, and the whole is cemented and reinforced by the extension of the self regarding sentiment to the group Every child and adult must form a number of such group sentiments for bodies, ranging from those which are small and physically apprehensible, to others of widening scope and significance, and the larger and more ideal cannot be appreciated without preliminary experience in the more personal

[1] *The Crowd in Peace and War* Conway, p 173
[2] *The Instincts of the Herd in Peace and War* Trotter
[3] *The Crowd* Gustave le Bon
[4] Note especially Chs II to IV

and tangible relationships to the smaller bodies 'Patriotism itself is,' says McDougall,[1] 'the crown of a system of group *sentiments*'

In considering the school situation, it must therefore be borne in mind that what may seem trivial opportunities for *co-operation loyalty* and *leadership* have actually immense significance for practical training in national and world-citizenship

CO-OPERATION

While most psychologists agree that the development of the gregarious propensity which makes team work and team play possible occurs only in the early teens, it is generally recognized that the basis of the social attitude is laid much earlier Adler[2] maintains that it is practically determined, short of a deliberate and understanding attempt at readjustment later in life, by the age of four or five The mother is the first educator in this respect, she either keeps the infant's attention fixed exclusively upon herself, and the few closest relatives, or she extends it by the inclusive welcome which she gives to others and which the child responds to by sympathetic contagion. By the time he comes to school the world is already his friend or his enemy Although in the pre-school years the child is, as Piaget[3] has shown, essentially *ego-centric* in his thought, language and behaviour, that does not lessen the importance of surrounding him with play fellows in whose company he talks and plays his games, and who offer him resistance and the beginning of a training in co-operation By the age of seven he has reached a stage of real inter-communication with his fellows and from that time on he discovers himself increasingly as one of a group

By the time the child goes to school it is generally said that 'he needs to be with children of his own age He finds himself with perhaps 20 to 50 of them in a class They are in lesson time the audience before whom he finds himself superior or inferior,—who successfully evoke his assertion and submission

[1] *Outline of Psychology* McDougall p 433

[2] *Psychologies of 1930* ed C. Murchison; *Individual Psychology* Adler p 403

[3] *Language and Thought of the Child* Piaget.

This situation has, if not in our kindergartens, at a few stages higher up the school, usually been artificially strengthened by the system of marks and places so that "top," "bottom," "above X," "beaten by Y," become important concepts to many a child This has generally been understood as an educationally useful sublimation of self assertion, known as emulation or rivalry

Teachers, realizing the stronger appeal of the smaller group in early years, and becoming nowadays self conscious of the appeal to an egotistic emulation, often seek to extend self regard by dividing their children into rival groups whose points are collectively estimated This is sometimes strengthened and extended throughout the school by a "house" system of points, which include marks for work as well as for games, conduct and other activities

The *New Education* alive to the dangers even of group emulation, has offered two substitutes, embodied in no one scheme or method, but inherent in the ideals of free education which find expression in the Montessori system, the Dalton Plan, the Decroly Method and all other "Project Methods" The two elements of competitive emulation and of group training are separated Emulation is to be against the *self*, the child sets out to achieve self mastery and may actually, as in the Dalton Plan, chart his own progress, and his work will always be adjusted in difficulty to his own reasonable achievement This tends to eliminate the wrong kind of assertion of the clever, and submission of the duller, towards their fellows Meanwhile the interaction of the group is to be purely co-operative and is to be used in the work process itself, and not merely for assessment of results The ideal is to have a common aim in an achievement calling upon varied powers whose possessors are to use them as a contribution to the whole The groups form themselves naturally, group within group, undertaking subdivided labour Instead of rivalry, natural situations for mutual aid will arise, each child should ideally make his unique contribution to the whole, and the products will be a common possession

LOYALTY

No consideration of co-operation for mutual ends can be satisfactory unless it involves *loyalty* to the group itself, and a sentiment for it, apart from any egotistic satisfactions

Loyalty becomes especially susceptible to development in the early teens with the awakening of the gregarious propensity

> 'From eleven," writes Homer Lane,[1] 'is the most difficult age, it is the self-giving age and the 'storm period' it sees the breaking up of self assertion, of the desire to be hero, and the search for a hero not oneself Fourteen shows heavy conflict between the pleasures of self indulgence and the new ideals of purposed and serviceable self restraint."
>
> 'But we still see the desire to show off, if we have earlier suppressed his self assertiveness and so have prevented the expression of altruism normal at that age. If the child is more interested in doing stunts' than in helping the team to win, then something has gone wrong the transfer from original egoism to the group spirit is incomplete.'
>
> The boy at this age will be ready to sit and keep the score if that will help the team, in any case the team is his unit"

In the older public school, and in some measure in the newer, the emphasis is upon the glory of the school itself Recognizing that the team spirit is enhanced by uniformity of conduct and appearance, and a common adherence to symbols, which is made explicit upon occasions of special celebration, such as speech-days, thanksgivings, and anniversaries, stress is laid upon certain codes of "good form," upon uniforms, badges, colours, school songs The group-sentiment is further strengthened by opposition so that inter-school matches, examination results, and other contests, have been made important features

There is to-day a somewhat indiscriminate tendency to sneer at such loyalties, to laugh, for instance, at the "school tie It may be that the cloven hoof of the ego the suspicion of extended self regard, has aroused a kind of false pride which, in the desire to reach the highest stage of self-devotion without traversing any of the avenues which lead up to it, may miss the goal altogether Another explanation for this aspersion may

[1] *Talks to Parents and Teachers* Homer Lane p 105

be the fear of "jingoism' which tends to glorify the group at the expense of every other and makes in adult life for a disintegrating provincialism or nationalism opposed to international brotherhood, and heavy with potentialities of war Yet a third objection may come from the fear of loss of individuality, a dread of the herd hypnotism which Trotter stresses, or of the third level of McDougall which keeps a man chained to public opinion. These dangers need careful counterbalancing, but to put group loyalty on the scrap-heap for fear of them is surely ' to pour away the baby with the bath-water "

LEADERSHIP

It has generally been admitted that education has aimed too much at turning out the *average or normal type*, [1] at the moment its attention has oscillated to the subnormal, but the supernormal has had little or nothing done for him Conway [2] attributes this to the fact that the brilliant are resented and feared by the community There may be some justification for this view in the democratic schools of our public systems In the old-established, so-called ' Public Schools' of the British tradition, however, the incentive of university scholarships has usually marked out the intellectually supernormal boy for special attention from early days But however it may have been in the intellectual sphere, opportunity for the realization of physical prowess has usually not been lacking, probably one reason why the sports field has had so strong an influence is that it offered scope for recognized achievement. In the sphere of character and moral development, the institution of ' prefect and captain " systems has given scope for considerable exercise of the protective and assertive instincts in the cause of administration and hence in the development of leadership Those who lead are of the " crowd themselves, and know and share its feelings, they are thus less likely to arouse anti authority reactions At the same time they learn to *think* beyond the crowd, they become in a sense its brains and learn to see with the eyes of responsibility In some schools, however, there is the risk that their functions

[1] See Ch. X. [2] *The Crowd in Peace and War*, Conway p 183

should become too negative, too disciplinary in the policeman sense of being mainly alert for breaches of rule In this capacity they soon become recognized as the extended arm of the adult authority, and are perhaps not regarded without a suspicion of espionage Hence a conflict may be set up within the mind of the prefect himself, in feeling and sympathy he belongs to the herd, in the responsibility given him, which appeals to his self regard and propensity for assertion, his loyalty is due to school authorities On the one hand he risks unpopularity, on the other his position and prestige, solutions of "playing to the gallery, priggishness, or compromise in double dealing, will be open to him, but none will be satisfactory, and his first induction to responsibility with its unpleasant conflict, may well engender in him a dislike which will make him want to escape the burden for the rest of his life

Such offices should be a training in constructive thought. Even young children realize the need for organization of any "crowd,' and appreciate the hierarchy of office which results[1] If the same spirit of co-operation to mutual ends is shared by staff and pupils, the experience which comes from even the most minor office will lead to quickened understanding and appreciation of staff functions, and to gratitude and co-operation *Views should have honest outlet, captains and prefects should* hold office in a representative spirit as mouthpieces of their group but not as slaves to public opinion, there should be the preparation of many smaller co-operative offices to develop initiative Care should be taken that no mere herd spirit, trading on mass-suggestion, should prevail at meetings[2] In this way the personal factors upon which group government is based will be more insightfully comprehended, statements and judgements will be critically checked and the views of minorities more respectfully treated This seems much to hope for and will be accomplished in greatly varying degrees But there is no reason why exercises in self government should not be handled in a way which should do something to overcome the

[1] Cf op cit. p 134 "Discipline inevitably begets rank. Only when organization is low does equality actually not merely theoretically exist.

[2] See p 72 above.

thoughtlessness, apathy, mental inertia and one sidedness which sterilize much so-called popular government, for wider group attitudes must have their genesis in the smaller spheres It cannot be too much stressed that sentiments here, as elsewhere, stretch out from concrete particular, through concrete collective, to abstract, when the mind is capable of reaching out from what is perceptually to what is imaginatively represented

It is in this recognition that the Guide and Scout movements have had their great appeal The unit is the patrol with its separate emblem, leader and second, the officers hold their 'court of honour' to plan all the company's activities with the leaders, and all wear the company colour, the officer is "primus inter pares, 'one of us, one who belongs, and shares all the emotional reactions of the company The hierarchy of district captains," 'commissioners, and so on, stretches out towards the great ' over-crowd " with its common codes, emblems, passwords,—the world movement of all creeds and races And all this is brought about, and the most so where it functions most effectively, by co-operative mental, physical and moral activities, freely undertaken in a play spirit of adventure Its success may well serve as an encouragement to educators to believe that lawlessness is not the natural reaction even for immature personalities

Allied to the subject of social training, there arises the problem of the pugnacious propensity which has played such a prominent part in history

PUGNACITY

Pugnacity with its emotion of anger is regarded by most men as one of the most fundamental and ineradicable of human propensities Opinions differ about the desirability of its eradication, but all are agreed upon its inherency Those who demand eradication of the primitive form by whatever sublima tion, look towards an era of world peace Those who find a value for it, base their argument [1] upon the national and racial importance of the virility which it fosters To the end of life anger remains with most people liable to impulsive uprushes

[1] These arguments are set out in *The Great Society* Graham Wallas, pp 164 f

against obstruction, but for the most part it is found organized with fear into the sentiment of hate It is generally recognized as stronger in men, though this may be partly due to its more smouldering manifestations in women on account of the conventions of a masculinely ruled world which forbid little girls to share the dog's delight to bark and bite. Melodrama, in agreement here with psycho-analysis, never tires of stressing the connexion of anger with thwarted sex impulse, and the jealousy of the 'eternal triangle" situation is the stock in-trade of many a novelist. The thwarted parental instinct has also its revenges, more than one case of lynching has turned upon a real or fancied injury to childhood Yet the wounds of self regard, if less violent in their effects, are perhaps the most insistent of all, for the self and its occasions are ever prevalent

A few children, those suffering from inferiority-complexes," show a *defect* of pugnacity, a pusillanimity But most children err on the side of *excess*, and in early years scenes of passionate outburst, kicks, cries, are seldom wholly absent. They should accomplish nothing to the child's satisfaction, public opinion soon expresses its view that they are infantile, and to be controlled, and if wisely treated they soon become of rare occurrence. The worst treatments for passionate (in the sense of pugnacious) dispositions are (i) to augment the number of outbursts by teasing a malice towards which children are prone, and which, working by the *law of use*, accentuates the propensity, (ii) to give way to the outburst, as is sometimes done for peace or the neighbours sakes, the young child pays scant attention to the warning that it will not succeed next time, and much to the immediate gratification which satisfies the *law of pleasure and pain*, (iii) to meet the child's anger by an emotional reaction either of anger, distress and tears, or of reproachful tender emotion In the last case sympathetic reinforcement of emotion will result, unfortunately it often happens that emotional children have emotional parents, and that they are reproducing and playing upon the passionate reactions they see in the home That is one reason why school is often a better environment for them, the emotional aspect gives place in the classroom to a predominance of cognitive and conative aspects

It is obvious that in civilized society there is small scope for

the crude reaction, and that the crude excitant is equally out of place in the developed ideal

Towards what objects may its great force be *sublimated?* The answer seems to be threefold (i) It should be directed towards things rather than persons, the mastery of physical forces, of intellectual difficulties, the war upon disease, foul housing conditions, against war itself, and every other social ill, and the fight against moral evil, these are civilization's war (ii) For every one there is the struggle for self mastery, for progressive unification of character (iii) On the physical side, and most imperatively in youth, there is sublimation in play and sport, for here pugnacity is tempered in its destructive aims by self assertion, which wishes to prolong the life of its rival as the occasion of its own self-display and gratification [1]

It is in the physical mastery of things and in sport that the answer is to be found for those who believe that war is necessary to conserve the force which comes from the adrenal secretions which Cannon [2] has described Actually modern warfare with its monotonous drill and its trench warfare out of sight of the enemy is not the natural excitant of these reactions as was the old hand to-hand conflict, neither is it the purging of the nation, for it is the physically 'C3' population who are left to propagate the race Cannon [3] has demonstrated by his glycosuria tests on students that the sugar secretions may take place in athletic contestants, and even in a milder measure in ardent spectators (as well as in examination candidates!) He therefore recommends *international athletic competitions* [4] as the best substitute for war, and a sublimation of rivalry which will enhance the standard of virility

To return to the school situation, it is necessary to beware that watching the expert is not allowed to oust performances of lesser prowess Not all children should be forced into the same physical sublimations, and some are constitutionally unfit, but wherever possible outlets which give pleasure should be found involving super-efforts upon occasions, and, as will be seen in discussing fear, a measure of risk. Thus football is

[1] *Social Psychology*, p 97
[2] *Bodily Changes in Pain Hunger Fear, and Rage* Cannon.
[3] Op. cit., pp 75 76 and 220-221 [4] Op cit. Ch. XV

better for boys than tennis or golf Some too need outlets in boxing and fencing, which are unnecessary for girls On the other hand the exhilaration which comes from strenuous mountain-climbing, swimming or rowing, is not so dependent upon social emulation.

One other contribution towards sublimation lies within school control, namely, a change in the teaching of history The old style of text book with its stress upon battle-strategies and casualties, and its indiscriminating national approbation and self glorification, has probably been answerable for much which has been attributed to "nature" Objectors will claim that 'boys will be boys' and that they relish that kind of thing and must give vent to these primitive feelings at the 'psychological' stage Such phantasies surely have their safest outlet in 'represented tragedy', let them meanwhile stage plays or devour detective stories and blood and thunder adventures if need be, and not project their belligerencies on to other nations

To come next to fear is to turn the medal on the reverse side

FEAR

There is some disagreement about whether the child is born with an excess or a defect of fear He has sometimes been credited with a heavy racial endowment in excess of civilized needs, Freud thinks[1] that the child brings little real fear into the world with him and has to be taught self preservation.

It is a moot point whether it would be possible to bring up a child free from any fear, except perhaps the naturally acquired fear of fire, and the necessary caution against traffic and other obvious dangers As it is, he is usually soon trained to fear a wide range of objects[2] One reason for this is the parental anxiety which, arising out of fears for the child's safety, communicates itself to him at every turn, teaching him, if he is responsive, to fear dirt, germs, wet feet, draughts strange dogs, strange foods, strange people, tree-climbing, and a hundred other things Another cause is the disciplinary power of fear,

[1] *Introductory Lectures* Freud p 340

[2] A subject well developed in "Psycho-Analysis for Normal People" G Coster Ch IV *Fear in Childhood*

it is the quickest and most effective inhibitor of action, and as such is the weapon, by threat, word or action, of many nursemaids, parents and teachers who are lazy, harassed, or inept in the care of children. Pain is an original excitant and its potency can soon be extended to other forms of punishment, to threats of the policeman, the bogey-man, witches and hell-fire to rats,[1] wild animals, prison and the dark, worst of all perhaps is the fear of ridicule,[2] with its humiliating self-abasement

Add to this that the child has his own phantasies, inherited or not, but unexpressed and largely subconscious, and that these commonly seize upon such concepts as witches and bogeys and clothe them with painful emotional elaboration, and it will be seen that a wide range of morbid fear possibilities lies open These are again extended and reinforced by the particularly strong sympathetic induction characteristic of this emotion, so that children's fears quickly communicate themselves to one another

Opinions differ about the psychological origin of fear Freud thinks that it arises from the repression of the sex instinct which converts fear of the libido into anxiety, as a kind of wish fulfilment.[3] McDougall ranks it as a primary innate propensity He also notes that its consequences are liable to be especially harmful to mental health when the original fear is allied to a sense of guilt, which ministers to repression in the interests of the self regarding sentiment, sometimes producing amnesia, or pathological loss of memory, for the experience[4]

Fear is peculiarly apt to suffer from *repression* because society is especially hard upon any manifestation of fear, in men

[1] The writer once heard an uneducated woman who was dragging her howling child of two years along the street by the arm faster than his legs would carry him, say Here the rats will eat you if you don t shut up

[2] Cf Adler in *Understanding Human Nature* p 71 Numerous children grow up in the constant dread of being laughed at. Ridicule of children is well nigh criminal. It retains its effect upon the soul of the child, and is transferred into the habits and actions of his adulthood An adult who was continually laughed at as a child may be easily recognized be cannot rid himself of the fear of being made ridiculous again.

[3] Yet he does admit that real anxiety must be regarded as an expression of the Ego s instinct for self-preservation. See *Introductory Lectures* Lecture 25 p 343

[4] *Outline of Abnormal Psychology* pp 305 307

especially, thus safeguarding and projecting its own repressions, the traditional admiration is somewhat erroneously given towards absence rather than conquest of fear, and this makes its frank recognition and control socially unwelcome One of the most poignant studies of this conflict to be found in fiction is *The Coward*, by R. H Benson

Perhaps even more dangerous are the traumatic fear experiences which involve shock. A sudden intense stimulation of a particular mental system may produce such a high tension of energy as to cause serious disturbance to the psychic equilibrium, amounting sometimes to extensive dissociation, or giving rise to night terrors Repression and dissociation may combine to produce amnesia Thus Dr O Pfister[1] of Zurich narrates how several neurotic adult patients who came to him were found to have been in youth under the same schoolmaster, a man of sadistic severity

The evil effects which fear brings about in the normal life of the child need only a brief mention (i) It is always repressive of other natural impulses and prevents their unconstrained exercise, thus robbing the child of the outgoing adventurous attitude towards life which he will need for successful character development and achievement. The process of repression itself will be a constant strain upon the resources, whether it is occupied in repressing the knowledge of fear, or the other impulses which the fear is inhibiting Such a state is usually characterized by pallor, listlessness, lack of zest and joy in life, the disastrous physical results of the adrenal secretions have already been noted[2] (ii) Fear also holds the attention to itself, every instinct or propensity has a high potential of attention towards its excitant, which *ipso facto* withdraws it from other objects Thus the child who tries to spell out his words with the stick held over him is paying keen attention to the stick, but has little left for the words This fixation of attention is another factor in bringing about what it wishes to avoid The man afraid of falling off the plank bridge is the one most likely to fall

The teacher will sometimes detect symptoms of nervous fear

[1] *Some Applications of Psycho-Analysis* O Pfister, Ch. V

[2] *Bodily Changes in Pain, Hunger Fear and Rage* Cannon, especially p 269

in a child, pallor, general inattention and lassitude, starting, and even chorea (St Vitus's dance) Such a child needs careful treatment, rest and change may help, but not if it leaves him all the more alone and shut up with his fear Ridicule of his fear is the worst treatment The child needs sympathy, encouragement and an increase of self-confidence A direct probing will not unearth a fear unknown to himself, but observation may sometimes give a clue, and a psychologist would gain much information from his dreams When a definite object is irrationally feared, the gradual re-association (or reconditioning) under favourable circumstances may work wonders For example, a child may entirely overcome a fear of dogs if given a puppy to bring up

The educational aim is the elimination of fear, except it be the necessary modicum of caution required, for example, in traffic and with machinery There is also the sublimated fear which enters into awe for irresistible and perfectly adjusted power, and becomes a component of reverence

Again, school games offer another type of sublimation They should not pander to the gambler's thrill of risk, a form of excitement which should be unnecessary where healthy interests are being cultivated McDougall[1] suggests the sublimation which can be found in strenuous physical exertion, such as mountaineering or battling with the waves, as providing a stimulating and necessary preparation for life-situations which the boy at any rate will be expected to meet without flinching In these reactions the changes effected by the adrenal secretions are being put to wholesome, body building uses

[1] *The Energies of Men* McDougall p 308

CHAPTER VIII

THE DEVELOPMENT OF THE SELF IN RELATION TO (C) SEX, (D) REALITY

C

THE present century has seen an enormous change in attitude towards the sex impulse, mainly due to the work of Freud The change from Victorian repression has been startling and in many respects disconcerting In the first place, the concept of infantile sexuality [1] seemed to destroy the innocence and charm of childhood, secondly, the view of love, art and idealism as the products of sublimated libido seemed to injure their beauty and value, thirdly, popularizations of Freud's theories often supplied a convenient rationalization for the 'avoidance of repression'

In the first place, it must be borne in mind that Freud's experience has been gained from the treatment of neurotics and he has shown a dangerous tendency to generalize from the abnormal constitution to the normal

Secondly, it has to be remembered that *Libido* is an ill-chosen term, Freud gets as far as talking of 'de-sexualized' libido, for Jung it means the more or less undifferentiated life-energy McDougall [2] disagrees with Freud in his assumption that the fundamental source of energy should be regarded as deriving from this one instinct to the disregard of the others, and he entirely disagrees with the inclusion in the sex instinct of the parental or protective propensity which, he claims, shows itself far down the scale of life as an instinct in its own right. Finally, McDougall strongly opposes the use of "love as synonymous

[1] Most fully expressed in *Three Contributions to the Theory of Sex* London, 1925

[2] Cf *Outline of Abnormal Psychology* Ch. VIII and Appendix

with the emotion of the sex impulse, and deprecates the failure to distinguish between lust and the sentiment of love which is built up of many and varied elements, including a strong protective component, and into which the specifically sexual impulse may make but a late appearance

Thirdly, it is a very mistaken popular idea that Freud and his followers have ever taught either the possibility or the desirability of bringing up a child free from repressions Dr Susan Isaacs[1] puts the matter clearly in the Freudian terminology

> "I referred earlier to the popular notion that 'repression' is an evil thing and to be avoided at all costs This notion is, however, by no means soundly based Repression cannot be avoided in this massive sense, since it is one of the general mechanisms by which every ego deals, at a certain level of psycho-sexual development, with those impulses which cannot be satisfied in actual life, and the stress of which stirs up anxiety and guilt Some degree of repression is thus essential to a balanced conscious life and adaptation to reality Whether or not repression is harmful in its outcome is a matter of degree and its particular incidence And its amount and incidence are not directly within the control of the educator Repression is an internal and unconscious mechanism, not to be confused with external restraint or inhibition *Moreover, the idea that if we leave the child entirely free* to do what he likes we are thereby avoiding repression is a mistaken one, since, as I have already shown, this simply means leaving the child at the mercy of his own primitive super-ego, with all its accompanying phantasies of retribution We do not, and cannot leave him free to the expression of simple, uninhibited wishes, as is sometimes imagined'

Yet the crude notions of many adults, and the instability of training resulting from them, are some of the many social factors which make the child's position peculiarly difficult to-day The old rigid systems of discipline and collective education have been largely abandoned, and the child is often expected to be precociously capable of the self-discipline of the adult. Too often he is left to steer his way through a wider experience than has ever been thrown open to a child before, without any of the knowledge or guidance which an adult would consider due to

[1] *Social Development in Young Children* S Isaacs p 424.

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Secondly, it has to be remembered that *Libido* is an ill-chosen term, Freud gets as far as talking of "de-sexualized" libido, for Jung it means the more or less undifferentiated life-energy McDougall[2] disagrees with Freud in his assumption that the fundamental source of energy should be regarded as deriving from this one instinct to the disregard of the others, and he entirely disagrees with the inclusion in the sex instinct of the parental or protective propensity which, he claims, shows itself far down the scale of life as an instinct in its own right Finally McDougall strongly opposes the use of 'love as synonymous

[1] Most fully expressed in *Three Contributions to the Theory of Sex* London 1925

[2] Cf *Outline of Abnormal Psychology*, Ch. VIII and Appendix.

with the emotion of the sex impulse, and deprecates the failure to distinguish between lust and the sentiment of love which is built up of many and varied elements, including a strong protective component, and into which the specifically sexual impulse may make but a late appearance

Thirdly, it is a very mistaken popular idea that Freud and his followers have ever taught either the possibility or the desirability of bringing up a child free from repressions Dr Susan Isaacs[1] puts the matter clearly in the Freudian terminology

> "I referred earlier to the popular notion that 'repression' is an evil thing and to be avoided at all costs This notion is, however, by no means soundly based Repression cannot be avoided in this massive sense, since it is one of the general mechanisms by which every ego deals, at a certain level of psycho sexual development, with those impulses which cannot be satisfied in actual life, and the stress of which stirs up anxiety and guilt. Some degree of repression is thus essential to a balanced conscious life and adaptation to reality Whether or not repression is harmful in its outcome is a matter of degree and its particular incidence And its amount and incidence are not directly within the control of the educator Repression is an internal and unconscious mechanism, not to be confused with external restraint or inhibition Moreover, the idea that if we leave the child entirely free to do what he likes we are thereby avoiding repression, is a mistaken one, since, as I have already shown, this simply means leaving the child at the mercy of his own primitive super-ego, with all its accompanying phantasies of retribution We do not, and cannot leave him free to the expression of simple, uninhibited wishes, as is sometimes imagined

Yet the crude notions of many adults, and the instability of training resulting from them, are some of the many social factors which make the child s position peculiarly difficult to-day The old rigid systems of discipline and collective education have been largely abandoned, and the child is often expected to be precociously capable of the self-discipline of the adult Too often he is left to steer his way through a wider experience than has ever been thrown open to a child before without any of the knowledge or guidance which an adult would consider due to

[1] *Social Development in Young Children* S Isaacs, p 424

CHAPTER VIII

THE DEVELOPMENT OF THE SELF IN RELATION TO (C) SEX, (D) REALITY

C

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explained if occurring in an adult.' That they do sometimes become definite is well attested This may occur at even an early age, perhaps through the child's own touch exploration, or through tight and irritating clothing, bad handling, dirt, or *even through deliberate stroking by ignorant or unprincipled* adults for soothing purposes

> 'The proper attitude towards sexuality in the child is one of watchful hygiene, which must always be unobtrusive. The childish erotic impulses are often unconscious, and nothing is gained by rendering them conscious or by concentrating attention on them '[1]

For this reason any emotional vehemence is most harmful since it serves to aid complex formation by heightening emotion, corporal punishment is also to be avoided as it may in itself serve as an excitant to the impulse It is probably the pre school years which are the most significant for laying the right foundations here as elsewhere The following somewhat extended quotation from Havelock Ellis gives a lucid exposition of modern scientific opinion on the subject [2]

> It is now held by the best authorities that the sexual guidance of children should begin so far as its elements are concerned at a very early age, and that a wise and tender mother is the ideal person to perform this really maternal duty It may, indeed, be added that only a mother can perform it rightly, and the training of mothers is an essential condition for the wholesome development of children There is danger, it is sometimes said that *children's minds will* be artificially concentrated on sexual subjects of which otherwise they might remain blissfully unconscious It is important however, to remember the natural operations of a child's mind A child's desire to know where babies come from is not a symptom of sexual consciousness, it is a natural desire to discover an important scientific fact Again at a little later age, the desire to know and see how th[illegible] of persons of the opposite sex are made is equally [illegible] natural It is the forced and unreasoned supp[illegible] natural curiosities and [illegible] gratification [illegible] an unhealthy

[1] Op [illegible]

sexual consciousness The child secretly concentrates himself on the solution of these mysteries only because any open attempt to solve them is on every hand rebuffed [1]

'There should be nothing formal or special about the knowledge of sex imparted by the mother to her child When the relation between mother and child is natural and intimate every function must from time to time come up for consideration, and the sensible mother will deal with each as it arises, though without carrying her information further than the child's curiosity at the time demands Sex and excretion will be dealt with as simply as anything else, and neither with the slightest sign of repulsion or disgust It is sometimes said that the right attitude to inculcate is that both sets of organs alike are neither 'disgusting' nor 'sacred' But, in one way or another, it has soon to be made clear that, while both sets of organs are natural and neither disgusting, there is an immense difference in their ultimate significance, and that what proceeds from sex may be so tragic for the individual and so fateful for the race that, even if we reject the word sacred' for sex, we must find some other word of equal poignancy' We must not accept the notion of those foolish though well meaning people who wish to bring up children to regard sexuality as commonplace, on the same level as nutrition and excretion Along the line of biology it is easy to understand that sex is much more than that, it is not merely the channel along which the race is maintained and built up it is the foundation on which all dreams of the future world must be erected There are other and more personal ends to which the sexual impulse may be directed, but there is always this solid central fact' [2]

To pass from the pre school to the school stage is to come to the special problems which confront the teacher It is a moot point whether definite sex instruction should form part of his curriculum duties There is general agreement that where parents are willing and competent, such instruction is better

[1] Adler in *Understanding Human Nature*, p 71 notes Another aspect of this matter of not taking children seriously is the custom of telling children palpable lies with the result that the child begins to doubt not only his immediate environment but also to question the seriousness and reality of life

[2] *Psychology of Sex* Havelock Ellis p 124

given at home, there is a danger too in any wholesale method which cannot be adapted to the individual psychological development of each child A further practical consideration is the opinion of parents and school-boards, who, apart from prejudice, may reasonably demand assurances of fitness from young teachers The teacher, however, will at least not obscure and baulk the issues, and should be laying the scientific foundations Facts and questions which arise with young children in the ordinary course of the curriculum in such subjects as history, literature, and nature study, should be met with simplicity and truthfulness, few adults, and fewer children, pay much attention to answers given to others about topics in which they are not themselves interested at the moment, so that the risk of shock to those not psychologically prepared is small. Higher up the school, a methodical teaching of biology, covering the facts of life without undue insistence upon sex, should have the advantage of presenting the matter in a balanced, gradually unfolding and intellectually stimulating way Further, if local conditions present no obstacles to definite sex teaching as part of the hygiene syllabus in the highest classes there would seem to be no psychological objection to it so long as the two sexes are separately taught by teachers of their own sex

Whether or not direct instruction is given, the teacher must always be ready to deal candidly with children convicted of misdirected sexual behaviour and if necessary to enlighten them, singly or in groups The types of misconduct which are likely to come to notice are either definitely sexual, such as self stimulation or masturbation, and homo-sexual practices which may involve genital stimulation or they are combined with other impulses, when, as Burt remarks,[1]

> ' the union may issue in childish habits, which may be heavily but unjustly punished, from a false belief that the sole motive is some horrible perversion of a lewd or licentious caprice Of these, the commonest at the earlier ages are those monkey tricks in which the instinct of curiosity or the instinct of display excites inspections or exhibitions, all wrongly referred to downright sexual nastiness ",

[1] *The Young Delinquent* Burt, p 434

and, in a foot note,

> "It should be added that many of the habits to which school children are sometimes addicted and which are commonly reported as sexual, are really perversions of the excretory rather than of the reproductive processes The two types of dirtiness should not be confused Often, however, in actual conduct, the manifestations of all these different instincts become united, or merge the one into the other"

One such manifestation is the indecent scribbling which may appear on lavatory walls The children will readily be made to understand that this sort of thing will not be tolerated But mere punishment which either hardens the child's defiance or increases his self-depreciation and uneasy sense of guilt, can have no curative value, least of all must such a child be publicly shamed and upbraided, or his misdemeanours be retailed, he needs more, not less, self-respect, and for all the teacher can tell is the victim of a heredity or environment which needs much sympathetic counteraction. Sometimes such manifestations when they occur in groups or classes of children are best treated without emotional vehemence as infantile regressions, which should have been left behind and must not claim the attention of a developing personality with more important outlets and interests (and these should be abundantly forthcoming) Later, and not in the heat of emotion, sex-enlightenment should follow in a different context In any case individuals must be observed (without obtrusive suspicion) so that the maladjusted ringleader usually involved may be recognized and personally dealt with as occasion offers

A word may be said about the place of religious teaching in such training Too often religion is taught as a formal and purely intellectual matter, with a doctrine of salvation' expounded which is meaningless to the child because it is not related to the personal sins from which he wants to be saved, and so it fails of the positive relief, hope and inspiration of which he is in need

On the other hand, religious teachers must beware of making false emotional associations between the two sets of ideas so that unconsciously they become combined, as though religion were part of some mysterious repressing force into which

something of the emotional charge flowed ambivalently back.[1] The child's outlook needs to be directed away from himself once his problem has been resolved, and lifted up to God as objective ideal.

One further problem may confront the teacher, namely, the question of hero-worship, which in girls schools sometimes prevails in the form known as "starring No doubt this practice has erotic elements and it is best that public opinion should discourage it. When individual instances occur the teacher will do well to use tact and sympathy, realizing that she is a peg in the outward transference process and a transitory ideal, a harsh snub may throw the 'libido' back to an earlier and perhaps Narcissistic" (or egotistic) fixation point, a wise, balanced matter-of fact and parental friendliness will increase the girl's confidence in her world and encourage her widening affections

D

THE DEVELOPMENT OF THE SELF IN RELATION TO REALITY

It is impossible to complete the study of children's conduct without reference to their *play activities* This will involve a discussion of the child s world of *phantasy*, leading to an analysis of *feeling*, followed by an examination of some of the difficulties which may occur in making the transition from the world of play and phantasy to the world of external *reality*

Play has generally been differentiated from work by the three criteria that it is performed for the pleasure it gives, is freely and spontaneously undertaken, and is an end in itself

Emphasis in the past has been laid primarily upon the physical outlet which it presents, mainly in relation to the conscious life, the explanations have been largely biological At the present time the emphasis is being laid, especially in the play of young children with their toys upon the outlet which it provides for the unconscious life of phantasy thus enacted These two attitudes to play will be considered in this order

[1] Sex instruction should not, for example be given in *Church* though it may well form part of Confirmation or Church-membership preparation.

PLAY THEORIES

The older theories supply a number of partial explanations which doubtless hold some truth and value

1 *Schiller*, the poet, and *Spencer*, the educationist, came independently to the view that play provided an outlet for surplus energy, thus the young play more than the adult who exhaust their energy in work, the rich more than the poor This theory leaves the type of play unaccounted for, but it has obvious truth for a formless kind of childish gambol, and for the surge of hilarious exit on to the playground which customarily follows a morning s desk-work, especially with boys

2 *Stanley Hall* saw in play the best evidence for the *Theory of Recapitulation* or the *Atavistic* theory which views ontogenetic unfolding as a summarized form of phylogenetic progress, so that the individual is said to repeat in miniature the history of the race Examples are taken from the mud-pies, chasing hunting, tree-climbing plays of early childhood This psychological theory is no longer scientifically accepted though it is generally agreed that some *correspondence* does broadly exist between racial and individual development

3 *Karl Groos* has put forward the most extensive theory in his two books of exhaustive data, *The Play of Animals* and *The Play of Man* He regards play as the *preparatory exercise* of the instincts, and childhood as existing for the purpose of play, so that the young are enabled through playful experimentation to develop a wider range of reaction and to be born with their instincts less set and definite, and more open to modification Biological progress therefore advances with the lengthening period of dependence and play,[1] Play is the agency employed to develop crude powers and prepare them for life's uses The word *instinct* is used by Groos to signify motor mechanism or indeed all the *innate abilities*, and does not imply the propulsive force of the propensity, since it is merely playful experimentation His divisions and examples make this clear, he speaks of playful experimentation with the sensory apparatus, the mental powers and the impulses, as well as of love, imitative and social plays Adult play he explains as exercising and

[1] *The Play of Man* Pt 3 Ch. II, Karl Groos.

satisfying the sides of a man's nature which his other occupations neglect.

4 *McDougall*[1] agrees with Groos up to a point, that is, he thinks much play is the flow of surplus energy through the old easily functioning systems of the motor mechanisms which the instincts use, but without the actual arousal of the instinct or propensity with its emotional and impulsive force On the other hand he explains all but the simplest forms of play as more or less deliberately utilizing one or more of the innate propensities to increase the interest and the supply of energy, the most common thus used being the self assertive impulse which finds social expression in rivalry, though fear, pugnacity and gregariousness also make their contributions Games undertaken professionally, compulsorily, or for the sake of exercise do not fulfil the criteria of play Adult sport in general seems to take a place mid way between play and work, for it is scientifically pursued, and many motives are commonly involved in its exercise

PHANTASY THEORIES

The explanations from *unconscious motivation* have their origin in the work of Freud In *Beyond the Pleasure Principle* he describes the play of a boy of eighteen months old who never cried when his mother of whom he was very fond went out and left him for hours together[2]

"Occasionally, however, this well-behaved child evinced the troublesome habit of flinging into the corner of the room or under the bed all the little things he could lay his hands on, so that to gather up his toys was often no light task He accompanied this by an expression of interest and gratification emitting a loud long-drawn-out O-o-o-oh' which in the judgement of the mother (one that coincided with my own) was not an interjection but meant 'go away' I saw at last that this was a game, and that the child used all his toys only to play being gone' with them. One day I made an observation that confirmed my view The child had a wooden reel with a piece of string wound round it. It never occurred

[1] *Outline of Psychology* p 172

[2] *Beyond the Pleasure Principle* Freud London, 1922 (trans Hubback), pp. 12 26

to him, for example, to drag this after him on the floor and so play horse and cart with it, but he kept throwing it with considerable skill, held by the string, over the side of his little draped cot, so that the reel disappeared into it, then said his significant 'O-o-o-oh' and drew the reel by the string out of the cot again, greeting its reappearance with a joyful *Da*' (there) This was therefore the complete game, disappearance and return The meaning of the game was then not far to seek. It was connected with the child's remarkable cultural achievement—the forgoing of the satisfaction of an instinct —as the result of which he could let his mother go away without making any fuss He made it right with himself, so to speak, by dramatizing the same disappearance and return with the objects he had at hand The analysis of a single case of this kind yields no sure conclusion This effort might be ascribed to the impulse to obtain the mastery of a situation (the 'power' instinct), which remains independent of any question of whether the recollection was a pleasant one or not But another interpretation may be attempted The flinging away of the object so that it is gone might be the gratification of an impulse of revenge suppressed in real life but directed against the mother for going away, and would then have the defiant meaning Yes, you can go, I don t want you, I am sending you away myself We see that children repeat in their play everything that has made a great impression on them in actual life, that they thereby abreact the strength of the impression and so to speak make themselves masters of the situation But, on the other hand, it is clear enough that all their play is influenced by the domin ant wish of their time of life viz to be grown up and to be able to do what grown up people do It is also observable that the unpleasing character of the experience does not always prevent its being utilized as a game If a doctor examines a child's throat, or performs a small operation on him, the alarming experience will quite certainly be made the subject of the next game, but in this the pleasure gain from another source is not to be overlooked In passing from the passivity of experience to the activity of play the child applies to his playfellows the unpleasant occurrence that befell himself and so avenges himself on the person of his proxy From this discussion it is at all events evident that it is un necessary to assume a particular imitation impulse as the motive of play'

This quotation is given at length because it is probably the presage of the play techniques of child analysis which have sprung up since, in the hands of Anna Freud, Melanie Klein and Susan Isaacs, who all interpret their problem cases on the Freudian basis. The play-centres concerned with Child Guidance work, in London for example,[1] also make a use of play activities both for observation and understanding, and for the cathartic effect upon the child, toys form important cues as representing the *dramatis personæ* of the home situation The curative value of the treatment of problem children seems to consist in procuring acceptance by the child of the meaning of his acts.

In early days the unconscious wishes express themselves in active forms, so that play is a kind of acted dream As children grow older the elaboration takes place instead on the mental plane and does not necessarily issue in immediate motor effects It does, however, show itself in the type of literature chosen, because the reader enjoys projecting himself into that mythical or fictional presentation which best expresses his own inner phantasy and with which he can thus identify himself to his emotional satisfaction G H Green, in an interesting study,[2] *The Daydream*, finds the key to daydreaming in the unfulfilled wish for power and in an infantile ego-estimate which has been abandoned in conscious life, it is ' the imaginary fulfilment of repressed wishes of infantile origin ' He takes the oft recurring Cinderella theme as typical [3] " Power is to be gained in the first place by strategically depriving others of it, and it is to be used, in the second place, for evoking the admiration of others. Stated in adult terms, the whole will not be so very different It might be expressed thus Life offers no opportunities for the full realization of oneself, since it is entirely occupied with duties and with routine and with the discharge of obligations imposed by other people If it were possible to avoid these people, or to evade the obligations, then it would be possible to do things that really matter Green discusses several stages through which the daydream passes in the course of individual development From three to six years there is often

[1] See the interesting account given in *Play in Childhood* (1935), by M. Lowenfeld Co-Director of the Institute of Child Psychology

[2] *The Daydream* 1923 George H. Green. [3] Op cit., p 50.

an *imaginary companion* completely under the dictates of his creator This *egoistic* stage persists, he claims, until the *team or group* phase between ten and fourteen years, when the ego-estimate is thrown against a world-estimate and the desire is to be *primus inter pares,* to lead one's fellows and outwit the powers that be, the saving" and the ' treasure " phantasies are forms of this, the latter symbolizing the desire to steal from adults the life secrets they withhold Finally, the *romantic phantasy* of fourteen to eighteen or onwards transfers the interest to the companionship of a person of the opposite sex, daydream surroundings for the girl, at any rate, become rich, charming and exquisite

This type of thinking is of a primitive, *autistic* type, opposed to directed, rational thinking, with which it is necessarily in conflict for the domination of attention

Crichton Miller points out that phantasy is not merely *compensatory,* it may be *inspirational* in the attempt to transcend present knowledge and experience, a fruit of unsatisfied curiosity, which, if progressive and not regressive, may be the impulse to discovery and aspiration, or it may be *creative,* issuing in practical or artistic modes of " self-expression "

Before discussing the stages, degrees and incidence of the transition which has to be made from the world of play and phantasy to the world of reality, it is necessary to break off to attempt some explanation of *feeling* which plays so wide a part in the process

Feeling is a concept of psychology which has been little understood or analyzed It used to be described as an attribute of sensation, so that all sensations, either inherently, or according to their intensity, were regarded as *pleasant* or *unpleasant* Attempts to relate these two modes to specific organic reactions of wide general patterns have hitherto failed, some have suggested the coincidence of pleasant feeling with smooth and easy brain action, and unpleasant with slow and impeded brain action, yet at the smoothest stage of automatic action feeling is absent. Equally unsuccessful have been the attempts to find some specific organ of feeling McDougall, without being able to say more about the *physiological* basis of feeling, has a useful analysis of its functions and kinds He regards the two

primitive modes of feeling as *pleasure* or *pain* ("painful feeling," not pain sensation) These are conditioned by our *cognition of the success or failure of our striving or conation*—that is, "by the interplay of cognition and conation"[1] "The failure of our striving is the essential condition of unpleasant feeling,"[2] as the success is of pleasant And it has already been shown in Chapter III that it is the function of pleasure and pain to influence and guide activity in two ways

> "First, pleasure, arising in the course of mental activity, supports that activity, sustains our striving in the direction, or of the kind, which brings pleasure, it strengthens and prolongs the impulse or conative tendency at work in us. Secondly, on recurrence of a situation of the kind in which we have striven successfully, our tendency to strive again in the same way is stronger, the tendency seems to be confirmed by the previous experience of success, and this confirmation of the tendency may fairly be regarded as a consequence or result of the pleasure experienced on the former occasion. Conversely pain, arising during striving, tends to divert the striving to other directions, and on renewal of the situation in which we have striven unsuccessfully and (in consequence) painfully, our tendency to strive again in the same way is weakened or abolished or diverted to some new direction, these weakenings and diversions of the impulse seem to be the effects or consequences of the pain experienced on the former occasion"[3]

Thus, as has already been seen, feeling is intimately connected with emotion which it invariably accompanies[4] To the question whether pleasure and pain are necessarily bipolar or can be blended, he replies that the blend is possible and quotes "parting is such sweet sorrow"

Differentiated from these two primary types of feeling are the *complex feelings*,[5] of which McDougall lists a number, dis

[1] *Outline of Psychology* McDougall p 348
[2] *Energies of Men* McDougall p 155
[3] *Outline of Psychology* McDougall, p 270
[4] The word *affect* is used by McDougall (*Energies of Men* p 156) to signify this blend of emotion and feeling; some psychologists employ the term *affect* as synonymous with *feeling*
[5] Called *derived emotions* in *Social Psychology* (supplementary Ch. II) and the *Outline* (Ch. XII).

tinguishing the *prospective complex feelings* of *confidence, hope, anxiety, despondency,* and *despair*, experienced in greater or lesser intensity according to the strength of the conation the success or failure of which is being cognized, and the *retrospective complex feelings* of *regret, remorse,* and *sorrow*, always painful because necessarily thwarted, *joy* derives from both prospective and retrospective sources Sorrow implies the preformation of a sentiment of love, and joy of this or of some other sentiment. McDougall distinguishes pleasure, joy and happiness as follows

> "Pleasure is a qualification of consciousness of momentary duration or, at most, of a fleeting character, and it arises from some mental process that involves but a mere fragment of one's whole being Joy arises from the harmonious operation of an organized system or sentiment that constitutes a considerable feature or part of one's whole being, it has, therefore, potentially at least, a greater persistence and continuity and a deeper resonance, it is, as it were, more massive than pleasure Happiness arises from the harmonious operation of all the sentiments of a well-organized and unified personality, one in which the principal sentiments support one another in a succession of actions all of which tend towards the same or closely allied and harmonious ends Hence the richer, the more highly developed, the more completely unified or integrated is the personality, the more capable is it of sustained happiness in spite of inter-current pains of all sorts "[1]

THE TRANSITION FROM PLAY TO REALITY

From what has been said of feeling it will be readily explicable that the young child must find his satisfactions and pleasures mainly in the unreal world of play and phantasy, in which in a "make-believe" way he can carry out his "instinctive" or impulsive strivings to the successful ends which real life would deny to his physical and mental impotence.[2] Untrammelled food-seeking, assertion, acquisition, curiosity and so on, find their expression and gratification on the imaginative plane. This will explain why in fact the child takes his play so seriously

[1] *Social Psychology*, McDougall p 134

[2] What Adler would call his "organ inferiority"

Piaget believes that he lives in two worlds, and Koffka, in a beautiful last chapter,[1] "The World of a Child," in the *Growth of the Mind*, describes how the child lives as it were in two 'configurations" Piaget traces the child's development thus [2] Up to two or three years old, reality is for the child simply what he desires, he is dominated by what Freud calls the *pleasure principle* From thence up to seven or eight years of age two heterogeneous but equal realities appear, the world of play and the world of observation, but the two planes are juxtaposed or put side by side, not synthesized, in the presence of one he seems to forget the other,[3] thus the illusion which can transform a stick into a doll serves only for the play world, and the stick is not so perceived out of it, this is a stage of *ego-centrism*. From this stage up to eleven or twelve, the two worlds begin to assume some hierarchical arrangement, which obviates contradiction, play and work become differentiated, the difficulty of discrimination has been shifted to the verbal plane and, as Binet found, the child cannot yet appreciate verbal absurdities. From twelve he completes this hierarchical arrangement by means of his increasing power of formal thought and logic

Two opposite difficulties may hinder this transition (1) Reality may be made so hard for the child and at such an unduly early age, that he may retreat from it into phantasy and reject the adult world of demands and prohibitions, or he may abruptly accept the crude world of reality as excluding all romance and idealism, and pay for repression and one-sidedness in cruel or neurotic symptoms (2) The world of play may be made so absorbing and restricted that it holds the child at some fixation point which should have been passed earlier, a cloying maternal affection sometimes has this effect In old days of harsh discipline the schools encouraged children to grow out of them as soon as possible and increased the desire for adult exemption from restriction In a suggestive little book, Geraldine Coster alludes to this danger [4]

[1] *The Growth of the Mind* Koffka Ch. VI
[2] *The Judgment and Reasoning of the Child*, Piaget, p 246
[3] *The Growth of the Mind* Koffka p 379.
[4] *Psycho-Analysis for Normal People* G Coster, 1932 p. 82

'We have to face the fact that the present-day custom of making a child's life as ideally happy and free and interesting as possible brings with it the danger of his refusing the next step As therefore we have made sacrifices to provide the happiness of his childhood, so we must very definitely sacrifice our pleasure in having him dependent on us, and of set purpose teach him to face adult life with confidence and courage "

It is not the aim of education to create *Peter Pans*

" How far is it (i e the truth of the phantasy) apprehended by the adults who take children to that play? It is that every single child has to go through the temptation of Peter Pan that the temptation to retreat from reality and escape into phantasy and to live in a world of dreams is always near the child in adolescence, and that if he goes too far, he is unable to get back This is the fate of Peter Pan ' [1]

The way out seems to be to supply ideals from reality through history, biography, and science, and to give in the real world of work scope for such achievement as will be more satisfying than the pseudo-achievements of play or of compensatory phantasy These last will then take their rightful recreative place and leave the attention free for directed, constructive thought and action

[1] *The New Psychology and the Teacher* Crichton Miller p 72

PART II

THE PSYCHOLOGY OF ABILITY

CHAPTER IX

SPEARMAN'S THEORY OF INTELLIGENCE AND COGNITION

IN Part I of this book the psychology of conduct has been built up mainly upon the tenets of the hormic and psycho-analytic schools; in Part II the psychology of knowing and learning will have as its ground structure the cognitive psychology of Professor Spearman.

Professor Charles Spearman was for many years Grote Professor of Philosophy of Mind at London University, and for over a quarter of a century has been working at his theory and directing the researches of a large number of adherents, with the joint support of Professor Aveling, University Reader in Psychology at the University of London Hence this School is generally known as the *London School* of Psychology, and its wide acceptance in that geographical area is steadily influencing both educational[1] and industrial[2] theory and practice, in spite of the controversies which still revolve around some of its tenets and mathematical formulæ The basic exposition of the doctrine is to be found in Spearman's two luminously clear, yet condensed

[1] Cf its acceptance by Sir Percy Nunn in *Education Its Data and First Principles* new edit, and by Dr Ballard in *The Essentials of Arithmetic* and *Thought and Language*, where he describes it as the only constructive theory of intelligence that has ever been put forward p 297

[2] Cf its use by J W Cox as recorded in *Mechanical Aptitude* and *Manual Skill*

and exacting volumes, *The Nature of Intelligence and the Principles of Cognition*,[1] and *The Abilities of Man*[2] A more popular series of smaller works, in harmony with this standpoint where they touch upon it, is now in process of publication[3] Yet it is only very recently that the theory has been available for the beginner in text book form,[4] and the tentative references of a few of the general text books have done little to overcome the initial obstacle of a new terminology

Nevertheless, it is no exaggeration to say that to pass from the old type of text book, with its descriptive comments on perception, imagination, thought and allied processes, based on the associationism which it professes to deny, and to become for the first time acquainted with the cautious lucidity of Spearman's theory, is like the emergence from a smoky tunnel into clear mountain air, the experience is at once rational and æsthetic.

THE TWO-FACTOR THEORY OF INTELLIGENCE

The earliest promulgation of his *Two-Factor Theory*, in 1904, synchronized with the empirical efforts of Binet and Simon in Paris to frame a set of intelligence tests for diagnosing the mentally defective The present century has seen an enormous amount of activity directed towards the testing of "intelligence," but, as Ballard has observed,[5] "While the teacher tried to cultivate intelligence, and the psychologist tried to measure intelligence, nobody seemed to know precisely what intelligence is" Spearman complains that 'In truth 'intelligence' has become a mere vocal sound, a word with so many meanings that finally it has none"[6]

Most psychologists have been content with mere descriptive *statements about* intelligence, that it is, for example, the ability to *adapt oneself to novel situations*, or to carry on *abstract thinking*

[1] 1923 [2] 1927

[3] The Contemporary Library of Psychology ed F Aveling to which belongs *Creative Mind* (1930), by Spearman.

[4] Cf *An Introduction to the Theory and Practice of Psychology* Ll Wynn Jones, 1934 and *Ability and Knowledge* F C. Thomas 1935

[5] *Mental Tests* Ballard p 23

[6] *The Abilities of Man* Spearman, p 14

or *to learn* But these statements make no attempt to analyse the nature of the abilities involved in these processes They merely argue in a circle

Popular " common sense ' has clung to two familiar doctrines, both of ancient pedigree On the one hand is the parent or teacher who thinks that a child either *is*, or *is not* intelligent, that he is either bright, dull, or " average " This view conceives of intelligence as constituting a unitary function or single behaviour-unit, and is nicknamed by Spearman the *Monarchic* doctrine, as it implies the rule of a single power On the other hand is the would-be discriminating critic who finds, for example, that John is dull at reasoning, but not without imagination,' or that Mary is quick but unobservant and bad at practical subjects But this attempt to subdivide intelligence into a few great powers, arbitrarily selected, is none other than the old Faculty psychology [1] which has been officially condemned Spearman nicknames this view of intelligence, as composed of a few separate ruling powers, the *Oligarchic* doctrine

More acceptable to scientists has been the subdivision of intelligence into a host of highly particularized and independent faculties, [2] which can only be assessed by finding an average or by taking a sample ' from a hotch potch of tests, —an *Anarchic* doctrine

Spearman set about subjecting numerous operations to the mathematical criterion of the coefficient of correlation, a general measurement which has been especially developed for psychological use during the present century The correlation coefficient gives a number ranging between one and zero (usually taken to two decimal places) which indicates how far The changes in any variable magnitude are accompanied by corresponding changes in another one [3] If the correlation coefficient comes out on the minus side it is said to be inverse, and indicates incompatibility of the two variables measured [4]

This statistical tool has made it possible to submit to mathematical proof the question whether operations of the same form

[1] For an account of this see Appendix I

[2] *Educational Psychology* Thorndike p 39, Quoted *Abilities of Man* Spearman p 56

[3] *Abilities of Man* Spearman p 56

[4] For mathematical explanation and formula see Ch. XVII below

but varying subject matter, or even operations of very different form, are, or are not, executed well by the same person The results have shown an incomplete correspondence expressed by a positive correlation coefficient of varying magnitude, clearly indicating the "continued tendency to success of the same person throughout all variations of both form and subject matter"[1] Work with correlations (e g between scores for tests, marks for school subjects or estimates of impression) attracted Spearman's attention to a peculiar arrangement to which all the correlations tended This arrangement he expressed in the form of the *tetrad equation* which gives a value known as the *tetrad difference* which may be explained thus[2]

"If a, b, c and d denote any four abilities, a tetrad difference is the correlation between a and b multiplied by that between c and d minus the correlation between a and c multiplied by that between b and d or in the usual symbols

$$r_{ab} \cdot r_{cd} - r_{ac} \cdot r_{bd}"$$

Spearman's significant discovery is that when all the true tetrad differences[3] tend to be zero (i e

$$r_{ab} \cdot r_{cd} - r_{ac} \cdot r_{bd} = 0),$$

then and only then the score obtained by each person in each test tends to be resolvable into two parts of the following kinds One part depends on an element or factor which remains always the same in all the abilities of the same individual The other part depends on a second factor which, even for the same individual, differs freely from one ability to another"[4]

The former factor is a *quantitative* one "underlying all cognitive performances of any kind"[5], it is known as the general factor or g Its existence is incontrovertible, though its nature remains open to investigation Spearman regards it hypothetically as of the nature of an "energy" or "power" and postulates a physiological derivation. The second factor must, on the other

[1] *The Nature of Intelligence* Spearman p 5
[2] *Psychologies of 1930* p 342 footnote.
[3] *True* here means corrected for the *probable error* which arises in sampling
[4] *The Nature of Intelligence* Spearman p 5 [5] Op cit p 5

hand, be specific to each separate operation, it is therefore known as the specific or *s* factor There are hosts of *s* factors, probably deriving their constituents from the sensory or motor apparatus brought into play, or from retentivity As their distribution in the individual must follow the curve of normal distribution, presumably every one approximates to brilliancy at something, however insignificant its scope (perhaps the ability to balance a lump of sugar on the end of his nose), and to deficiency in some other more or less limited specific ability

Thus *g* may be regarded as the *power* which works through the *engines* or *s* factors Both factors occur in every ability, but in varying ratio In a talent for classics the ratio of the influence of *g* to *s* has been assessed as 15 1, whereas in a talent for music the ratio has been estimated at 1 4 The estimation of a person s *g* will therefore tell ' nearly everything about some of his abilities and something about nearly all of them '[1]

Persons with low *g* may have special aptitudes along certain lines, for example, drawing, singing, dancing, but no one would ever approach the front rank in these performances without the combination of a fairly high *g*, on the other hand, a person with high *g* might be almost entirely lacking in some such aptitude

One other point about the distribution of these two factors needs consideration high correlations have been found to exist over and above what are attributable to the common *g*, wherever the two abilities are akin, or, that is, wherever they possessed *overlapping s factors* Such factors ' may be defined as those which occur in more than one but less than all of any given set of abilities Thus, they indicate no particular characters in any of the abilities themselves, but only some kinship between those which happen to be taken together in a set. '[2] In other words some *s* factors are recurrent in different abilities in a greater or lesser degree For example, a man may prove to be a good shot and a good astronomer, success in both lines depends partly upon the common sensory factor of good eyesight. Overlapping *s* factors are known as *group* or *broad factors* The term *group factor* only is applicable to smaller overlaps, and to cases of overlap (whether narrow or broad) which occur between a restricted and specified range of abilities Thus in the example

[1] *Abilities of Man*, Spearman p 77 [2] Op. cit., p 82.

above it would be correct to speak of the common elements as a *group factor*, and the overlap between the two activities of mending a bicycle and making a Meccano bridge (i e mechanical aptitude) is correctly spoken of as a group factor when these two specified activities are being particularly considered. The term *broad factor* is applicable where there is an *extensive* overlap and where *ability as a whole* (and not merely one or two operations) is being considered Thus certain *broad factors* have been found to exist for *mechanical, social* and *arithmetical* abilities, and it is suggested that others may exist for *linguistic logical,* and *musical* activities Hence, when a man is spoken of as being 'good at arithmetic," reference is being made to a *broad factor*, over and above his measure of *g* It must, however, be borne in mind that all these overlapping group or broad factors are but another way of referring to recurrent *s* factors, and do not introduce a third factor into the theory This may be made clearer by exemplification from the work of J W Cox[1] whose research into mechanical aptitude revealed the existence of the broad factor *m*, which seems especially concerned with spatial relations this enables him to analyse success in any mechanical operation into dependence upon the *g* factor, a broad factor *m* and one or more *s* factors, specific to the activity in question.[2]

The Two-Factor Theory neatly and precisely embraces the partial truths of all the rival doctrines For the *g* factor accounts for the measure of truth underlying the Monarchic doctrine of a single unitary power, the *group factor* explains the persistent adherence of common sense' to the old 'faculties' of the Oligarchic view, and the *specific* factors explain the Anarchic conception of intelligence as constituted by a host of independent functions

THE DOCTRINE OF NOEGENESIS SPEARMAN'S THREE QUALITATIVE LAWS OF COGNITION

Having analysed the popular concept of "intelligence' into these two factors, Spearman proceeds to define the particular mental operations through which *g* is manifested

[1] *Mechanical Aptitude* John W Cox
[2] In a subsequent work he distinguishes another broad factor which he calls the "routine manual factor *Manual Skill* 1934

He finds that there are precisely *three* principles which govern the whole *nature* of cognition, and three processes through which they operate

I FIRST PRINCIPLE THE APPREHENSION OF EXPERIENCE

The formula for this runs —

"*Any lived experience tends to evoke immediately a knowing of its characters and experiencer*"[1]

Any lived experience is to be understood as comprising

(i) All the material which comes through the *senses*

(ii) The *feelings* or affections, that is, all the states of *pleasure* and mental *pain* (or unpleasure) studied in the last chapter

(iii) *Cognition*, that is, any active knowing process, for one can, as it were, cognize one's own cognition, as when a person says, "I noticed," "it seems to me", and this is the source of all introspective knowledge

(iv) *Conation*, for not only can feeling and knowing be apprehended, but experience can also be had of striving, desiring, willing[2]

(v) *The Ego* or experiencer himself "Whenever thoughts and sensations are experienced, there also, immediately in them and permeating them, and in the same way as themselves, we are aware of a subject-carrier, to which they are attached"[3]

Tends to evoke as noted in Chapter II and stressed by the analytic schools of psychology, it does not appear to be inevitable that cortical functioning should be accompanied by awareness or apprehension, though it does apparently *tend* to be so

Immediately is used here, not as referring to succession in time, but in the logical sense of without any *mediating* process', that is, the knowledge is not of the nature of inference, but is *self-evident*

[1] *The Nature of Intelligence*, Spearman p 48

[2] *Conation* is used here as covering *volition* for Aveling's distinction, see p 51 (footnote)

[3] Quoted from Ebbinghaus *Nature of Intelligence* Spearman p 55

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[1] *The Nature of Intelligence* Spearman p 48

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[3] Quoted from Ebbinghaus *Nature of Intelligence* Spearman p 55

II SECOND PRINCIPLE THE EDUCTION OF RELATIONS

The formula runs —

"*The mentally presenting of any two or more characters* (simple or complex) *tends to evoke immediately a knowing of relation between them*"[1]

The process is represented by the following diagram in which f_1 and f_2 stand for the two initially presented fundaments, and r symbolizes the relation tending to become known between them

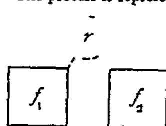


Fig 15[2]

Thus, whereas by the first principle one can say, 'I see red, I see blue,' the second will give such knowledge as "red and blue are different"

The items which bear any relation to one another are termed *fundaments* These fundaments can be (i) Any items which have come within the experimental apprehension of the first principle, be they concrete or abstract. (ii) Any relations educed by the second principle itself, thus one may educe not only that red and blue are *different*, but that they are *more different* than, say, red and pink.

Relations can be educed at many different levels, and there

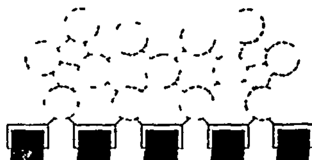


Fig 16

is no limit to the altitude to which they can be built up, so that, for instance, all the tones of an orchestra may be cognized as

[1] *Op. cit.*, p 63.

[2] *Abilities of Man*, p. 166.

a single motif This super-structure is represented in Fig 16 [1] the solid squares representing the items of the original sensory experience, the continuous lines, the primary apprehension of their respective characters, the dotted lines, the awareness of relations of higher and higher order

(iii) Finally, relations can be educed between any of the products of the third principle, which has still to be considered

A relation is to be defined as *any attribute which mediates between two or more fundaments*" [2] Relations classified according to the nature of the relations themselves (not of their fundaments) are of ten kinds, namely, those of

(1) *Attribution*—This includes the relation of a character to its fundament (e g of redness to the thing which is red) This kind of relation figures largely in the favourite intelligence test of *Analogies* e g,

shilling silver as penny (?) iron, sixpence, gold, copper [3]

The relation has to be educed between the first pair and applied to the selection of the right attribute from among the four words given to form a second pair with similar relation

(2) *Identity*—This would involve recognition of identity in spite of some change among the characters of the fundament, e g changes of position, colour, brightness An example from intelligence testing may be taken from the Code test sometimes given e g

Underline those digits which are wrong [4]

	*	@	‡	¶	℔	§	?	‖	†	$
Key	1	2	3	4	5	6	7	8	9	10

Sample	¶	*	†	
	4	9	2	etc

(3) *Time*—The relation is one of *sequence* (and must be distinguished from, for example, relations of likeness or identity between *temporal* fundaments) A class of children clapping

[1] Op cit p 79 [2] Op cit p 66
[3] From the *S African Group Intelligence Test* p 5
[4] *The Grey University Group Scale* Test 7

out the time values whilst listening to music during a eurhythmic class are educing time relations between temporal fundaments

(4) *Space*—Spatial relations are educed from spatial fundaments, though from the same fundaments other relations, such as those of likeness or identity may also be educed Thus in the following example of a test with spatial material, the first relation required to be educed is spatial, the second is not

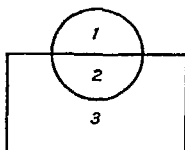


Fig 17[1]

i What space is in the circle but not in the rectangle?

ii What space has the largest number?

Geometry, mechanics and architecture are largely concerned with spatial relations, though these may also be educed upon the abstract level

(5) *Cause*—Much dispute and little investigation has attended this relation It is used in testing thus poison ill as food (?) eat, bird, healthy, hungry[2]

(6) *Objectivity*—This relation which Spearman refers to as the *psychological relation*[3] is involved in all interpretation of the experience and behaviour of other people by analogy with our own Binet used it in his "interpretation of pictures" test An example of this relation in its abstract aspect, used in testing, is

slow lazy as quick (?) timely, fast, industrious, hasty[4]

(7) *Conjunction*—This is that ultra-simple kind indicated by the word and' Its chief sphere lies in arithmetic'[5]

(8) *Constitution*—This relation is 'that which any fundaments and relations bear to the whole which they jointly constitute ,'[6] it works with the conjunctive class as when 2 + 2 are understood to constitute 4 Further examples are when three lines are taken to constitute a triangle, and successive

[1] Example taken from *S African Group Intelligence Test* p 15
[2] Op cit Form I p 6
[3] *Abilities of Man* Spearman pp 179 ff
[4] *S African Group Test* Form I p 6
[5] *Abilities of Man* p. 175
[6] Op cit p 183

words a coherent sentence It is a relation which, as will be seen, plays a large part in the *Gestalt* theory of psychology

(9) *Evidence* —This is a relation involved in logical reasoning, and much exalted in importance in the past. It is involved in reasoning and inference tests, e g ,

"How many boxes have got two marks? Many more than half of them are marked with red chalk, a little less than half with white chalk, and none with any other colour All? More than half? Less than half? None?" [1]

(10) *Likeness* —This includes its opposite, unlikeness ' The process of cognizing these relations permeates awareness of every kind" [2] It appears especially in three types of test, viz *Classification* e g Underline the word which should not be there jump, skip, run, walk, stand [3]

Same-opposite e g If the two words in each row mean the same, or nearly the same, put an S on the dotted line joining them, if they mean the opposite, or nearly the opposite, put an O on the line joining them

smooth	rough
hit	strike [4]

Synonyms e g *Not real* means most nearly the same as what? No good? Finished? Only supposed? Mistaken? [5]

All these ten relations tend to overlap, and intermingle in every sort of blend in the process of cognition Thus arithmetic, based primarily upon the conjunctive relation depends intimately also upon relations of likeness, constitution, and evidence

Eduction ' —A word must be said about this newly resuscitated word which is used to distinguish the manifestations of the second and third principles from those of the first— ' eduction ' being contrasted with ' apprehension ' Here the knowledge has an immediate source other than lived experience [6]

[1] *Measure of Intelligence for Use in Schools* Test 7 Spearman
[2] *Nature of Intelligence* Spearman p 71
[3] *S African Group Test* p 3
[4] Op cit p 13
[5] *Measure of Intelligence* Spearman Test —
[6] *Nature of Intelligence* p 76

III THIRD PRINCIPLE THE EDUCTION OF CORRELATES

This is formulated as follows

'*The presenting of any character together with any relation tends to evoke immediately a knowing of the correlate character*'[1]

Thus "when a person has in mind any idea together with a relation, he has more or less power to bring up into mind the correlative idea"[2] This, using the same symbols, is represented thus[3]

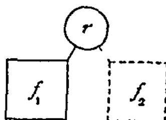


Fig 18

This time one of the fundaments and the *relation* are given, and the new knowledge is in the form of a new fundament

This is used in intelligence testing in the *Analogies* test, thus

Clothes man—feathers (?) coat, hat, bird tail[4]

First a relation is educed between the first pair, then another fundament plus this relation are used for the throwing out of a new fundament

The same thing is done with figures in the *Number Completion* test

Write into the blank space the number which ought to be there 10 9 8 7 5[5]

Another example may be taken from music, given a note, a pupil is asked to sing a note a minor third higher, if he knows this relation he may be able to produce the required correlate.

To take a graphic example suppose that a drawing is given, and a person asked to draw it "half as large again", at every point he must educe the required correlate

It is by means of this law that we are able to leap over the boundary between our own immediate, actual experience, to the imaginary and the transcendental Thus such flights of imagination are possible as enabled Swift to enlarge the fundament "human being to produce the Brobdingnags, or to diminish it to produce the Lilliputians, with all the circumstances

[1] Op. cit., p 91
[2] Op cit p 167
[3] Op. cit., p 7
[4] *Abilities of Man* p 166.
[5] *S African Group Tests* p 5

educed to match, or Wells to produce his "invisible man or his "men made gods," pure plays of fancy devoid of ob jective reality Moreover, the principle lays open the who realm of transcendental experience, so that the concept mortality and the relation of opposite can give the experiential inapprehensible concept of immortality, just as *finite* can giv *infinite*

These three principles can be symbolized and compare thus

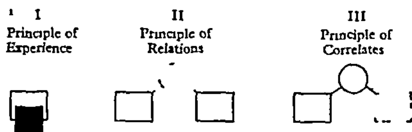


Fig 19

The amazing fact thus becomes apparent that the three pro cesses [2] which are the outcome of these three principles togeth "make up absolutely all the cognition (other than purely repro ductive) of which the human mind is ever in any circumstance capable" [3] They and they alone are generative of new item in the field of cognition." [4] For this characteristic manifestatio Spearman has coined the name *Noegenesis*, and the adjectiv *noegenetic* includes both the *noetic* property of being *self-evident* and the *genetic* property of generating what is new

Comparing this analysis with the old descriptive psycholog of reasoning closely related to logic, Ballard has written [5]

'The old term for the 'drawing out' is 'inference' o 'deduction.' Professor Spearman has given it the mor appropriate term 'eduction' and has defined it more closely

[1] *Nature of Intelligence* p 92
[2] There are three laws or principles stated in the formulæ and thre functional processes corresponding to them which bear the same names
[3] *Abilities of Man* p 167 [4] *Nature of Intelligence* p 61
[5] *Teaching the Essentials of Arithmetic* Ballard 1928, pp 10, 11 cf. also *Language and Thought*, Ballard 1934 p 290

The failure of traditional logic is probably due to the fact that it did not carry its analysis far enough it had not arrived at the elemental units It had reached the molecules but not the atoms, or, to be ultra modern, the atoms but not the electrons The honour of finding the electrons belongs to Professor Spearman His electrons are 'fundaments' and 'relations '

And again

It has been left to Spearman to formulate in the simplest way the laws that underlie the development of knowledge in the mind of man These three noegenetic laws may fitly be compared to Newton s three laws of motion Just as Newton's laws of motion apply to the whole field of mechanics, so do Spearman's laws of noegenesis apply to the whole field of cognition, except in so far as cognition is merely reproductive And just as at first sight Newton's laws seem very simple and obvious, but their bearing upon the behaviour of physical objects is only seen after close and detailed study so do Spearman s principles readily gain one s assent on first acquaintance but need to be specially studied in relation to the numerous problems of pure and applied psychology if we are to see how they illuminate the dark places, and make clear what was before vague and perplexing [1]

It remains to consider the way in which g is concerned in these processes Spearman s conclusion is that g showed itself to be involved invariably and exclusively in all operations of eductive nature, whatever might be the class of relation or the sort of fundaments at issue [2] The last two points are significant (i) It would appear that g is almost equally significant in the eduction of all ten kinds of relations Taking everything into consideration, the several kinds of relation are certainly not very disparate in respect of the degree that they make calls upon g There is, indeed, nothing to indicate that —when properly compared—they are even unequal at all [3] Thus the relation of *evidence* (involved in reasoning) would seem to have no prior claim as an indicator of g There are however, grounds for suspecting that some *group* factor or

[1] *Language and Thought* Ballard pp 293 294
[2] *The Abilities of Man* p 411 [3] Op cit p 208.

"special ability" is involved in the cognizing of logical relations [1] although it does not extend through the whole domain of the relation of evidence, judging by the differences shown between boys and girls there would also seem to be some group factor obtaining in the educing of spatial relations in the sphere of mechanics,[2] and perhaps geometry, another group factor may attach to the educing of conjunctive relations in arithmetic, [3] as also to the eduction of psychological relations [4]

(2) With regard to the nature of the fundaments, the idea that difficulty progresses as the eductions are made between material things, images or symbols of things, does not seem to be clearly proved, yet Strasheim has shown that mazes, though soluble with or without any abstraction, were accomplished more surely and with better transfer results when verbal abstraction was made [5]

QUANTITATIVE LAWS OF COGNITION

The three qualitative laws just discussed cover all question of *kind* or *nature* of mental operation, five further quantitative laws govern the degree in which cognition of this kind actually occurs They have received attention from psychologists in the past but have not been so systematically located defined and formulated as they have been by Spearman They will be dealt with in detail in later chapters as their various manifestations are discussed, here they will be listed with only the barest explanations

I THE LAW OF SPAN, CONSTANT OUTPUT OR LIMITED MENTAL ENERGY

Every mind tends to keep its total simultaneous output constant in quantity, however varying in quality [6]

Evidence concerning this law shows that *g* is manifested in both the *intensity* and the *extensity* of mental operation, and that these two seem to furnish alternative manifestations of the same mental energy Games such as trying to note in a glance the number of objects on a tray, and experiments upon trying to

[1] *Abilities of Man* pp 225-226
[2] Op cit p 231
[3] Op cit, pp 215 216
[4] Op cit p 230
[5] Op cit p 233
[6] Op cit p 59

do two things at once, bear upon this law, it accounts for the universal competition of items to enter consciousness, since a new one can only enter as a previous one recedes

II THE LAW OF RETENTIVITY

The occurrence of any cognitive event produces a tendency for it to occur afterwards" [1]

This resolves itself practically into two laws, viz

a The Law of Facilitation

Cognitive events by occurring establish dispositions which facilitate their recurrence '[2]

This includes as a special case of great importance *The Law of Association*

Cognitive events by accompanying each other establish dispositions to do so thereafter ' [3]

b The Law of Inertia or Lag or Perseveration

' *Cognitive events always both begin and cease more gradually than their* (*apparent*) *causes* ' [4]

This is not to be confused with steadfastness of purpose which seems to be even opposed to it

One of Spearman s surprising discoveries is that *g is not operative in retentivity*, which appears to be an *s* factor dependent upon the physiological peculiarity of the nervous system

III THE LAW OF FATIGUE

This seems to reverse the previous law

' *The occurrence of any cognitive event produces a tendency opposed to its occurring afterwards* ' [5]

It appears to concern the engines (the *s*" factors) rather than the energy (' *g* ')

IV THE LAW OF CONATIVE CONTROL

The intensity of cognition can be controlled by conation ' [6]

This is what is implied when children are called upon to attend, or when a person speaks of ' turning his attention " The determining conative factors have been considered in Part I

[1] Op cit. p 271 *Nature of Intelligence* p 132
[2] *Abilities of Man* p 271 [3] Op cit [4] Op cit., p 291
[5] Op cit., p 308 and *Nature of Intelligence* p 134
[6] Op. cit., p 347 and p. 135

V THE LAW OF PRIMORDIAL POTENCIES

Every manifestation of the preceding four quantitative principles is superposed upon, as its ultimate basis, certain primordial but variable individual potencies, such as age, health, sex and heredity [1]

More will be said about these potencies in the next chapter when the development and distribution of "*g*" as revealed by intelligence tests is considered

These five quantitative laws or principles, which control the functional distribution of *g*, do not each govern an active *process*, as do the three qualitative laws Nevertheless the five conjointly operate through three further processes, viz

1 *Reproduction* (i e reappearance in consciousness)
2 *Disparition* (i.e disappearance from consciousness)
3 *Clearness-variation* (i e along the scale of vagueness to determinateness, and of all the degrees of intensity, this change is compatible with all the items in consciousness remaining the same, it will be discussed under attention)

These processes do not generate new, self-evident knowledge as the three noegenetic processes do, they merely deal with the subsequent entrance into consciousness, the disappearance from it, or the variations in clearness, to which this knowledge is subject They are therefore called *anoegenetic* processes

Intensity and *determinateness* have been alluded to as two components of *clearness*, there remains the question of *speed* Spearman has shown that *g* measures a factor both in goodness and in speed of cognitive process, the two are interchangeable so that *g* is being measured whether it is accuracy or quickness of performance which is demanded, there is thus no real objection to a time-limit for intelligence tests purporting to measure *g*

> '*All knowing develops by way of increase in clearness* (i e intensity and determinateness) *and speed, that is to say, every item in the cognitive field comes into being by a continuous emergence out of utter obscurity up to some degree of clearness, and the emerging occupies some duration of time* ' [2]

[1] Op cit., p 360 and p 136

[2] Op cit., p. 244

Here then are *two* (or they may be regarded as *three*) further *quantitative* laws which are *universal* in character, and which furnish three characteristics of all cognition whatever

GENERAL DETERMINANTS OF ABILITY

Research into the manifestations of these quantitative laws and processes has led to the recognition of three phenomena which have been found to operate as functional units affecting the supply and control of *g*, and hence indirectly the *s* factors through which it works, in ways characteristic of all an individual's mental operations They are not in themselves abilities, having no specific performance manifestations To call them *broad* factors is misleading, since actually they are of *general* operation, but to speak of three more ' general factors ' is confusing, since they do not represent primary factors of ability Accordingly, the name *general determinants* of ability has been suggested for them [1]

They may be summarized thus [2]

(1) *p*, which stands for *perseveration* or *inertia*, represents the *lag* which characterizes the transfer of *g* from one engine to another

(2) *O*, standing for *oscillation*, denotes the unsteadiness in the supply of *g*, probably due to fatigue

(3) *w* may be taken provisionally to represent *will* or con sistency of action ' " A good deal of work has been done to prove th- influence of this determinant upon the direction of *g* *Profound* intelligence suggests large *g* and large *w*, while common sense suggests large *w* and less *g*

It is likely that the further study of *w* by members of the London School, such as Webb and Aveling will carry the factor theory beyond the realm of cognition right into that of conation, and that the ' instincts [illegible] may be fo[illegible] [illegible]ible to scientific analysis by m[illegible]

This comprehensive t[illegible] o[illegible] nitive field as mapped [illegible] mu[illegible]

[1] *Ability* a[illegible]
[2] *Psychol*[illegible] G "
End Sc[illegible]

the beginner by its scope. Its landmarks will grow in familiarity as he ranges over it, *first*, for the understanding of "intelligence testing", *secondly*, for the sorting out of those so-called *mental processes* (or faculties) of the older psychologists which have been judged to be of primary importance in pedagogical theory and practice.

As the scheme thus outlined has been built up by Spearman solely upon research investigations open to statistical verification by other investigators, he claims to have founded for psychology "a school to end schools".[1]

For convenience of reference, the principles and processes are set out below in tabular form.[2]

	Principles	*Processes*	*Developmental Characters*
Quality (Noegenesis)	I Apprehensibility of Experience	I Apprehension of Experience	
	II Eductibility of Relations	II Eduction of Relations	I Intensity
	III Eductibility of Correlates	III Eduction of Correlates	II Determinateness
Quantity (Anoegenesis)	I General Energy or Span	I Reproduction	
	II Retentivity	II Dispartition	
	III Fatigue	III Clearness Variation	III Speed
	IV Conative Control		
	V Primordial Potency		

[1] Op. cit., Ch. XVIII.

[2] Simplified from Spearman's tabulation in *The Nature of Intelligence*, p. 345.

CHAPTER X

THE TESTING OF INTELLIGENCE

INDIVIDUAL TESTS

INDIVIDUAL intelligence testing began with two French doctors, Binet and Simon, in Paris, as a result of their efforts to find a measure which would detect those mentally defective children who might be expected to benefit from education in a special institution.[1] The scale, which first appeared in 1905, was revised by Binet in 1908 and 1911, and would have undergone a further revision but for his death in 1913. The Binet scale of 1911 consisted of fifty-four separate items or questions, arranged so that five are allocated to each year from age 3 to age 10 (except for age 4, which has only four items),[2] also to ages, 12, 15, and to adult. The tests were allocated to the age-groups when it was found that from 65 per cent. to about 75 per cent. of the children of that physical age were able to perform them.[3] In this way Binet evolved the concept of *Mental Age* as distinct from *Physical* or *Chronological Age*, which has proved such an important factor in testing. Further, he *standardized* the methods of giving and scoring the tests so that their results under different testers might be comparable. His psychological groundwork was uncertain; he aimed more or less at obtaining a sample of a number of varied performances of an individual, measuring the validity of a test item as an indicator of intelligence largely by comparison with teacher's estimates and school records. The tests were not supposed to depend much upon schooling

[1] For the original account see *A Method of Measuring the Development and Intelligence of Young Children*, Binet and Simon.

[2] Described in *The Measurement of Intelligence*, Terman, Ch. III.

[3] Burt reckons that "To be assigned to any given year a test should be passed by approximately 50 per cent. of the children who are nominally of the year below." *Mental and Scholastic Tests*, p. 140.

but to be concerned with what any average child of the given age *might be expected to do and know* Burt[1] has compared mental age as measured by Binet's tests with mental age as measured by his own Reasoning tests, the school age, and the actual age, and he analyses Binet's mental-age components as 54 per cent. dependent upon school or educational age, 33 per cent upon intelligence, and 11 per cent. upon chronological age Here, however, was a test which was to some extent independent of schooling, and its immediate success was encouraging It found its warmest welcome in America, where it was revised, first by Goddard, and then by Terman in the famous *Stanford Revision*

The administration of such scales occupies from half an hour to one hour for each individual

GROUP TESTS

To overcome this difficulty there arose *Group testing of intelligence* This was given a great impetus by its employment upon a gigantic scale in the American Army during the Great War Its use has been described as "probably the greatest single piece of mental engineering that has ever been attempted in U S.A"[2] Group tests were applied to one and three-quarter million men, of whom 83,000 were then tested individually on the results shown The aim was to place the men where their ability best fitted them to be, and to form battalions of equal relative mental ability The tests used were of two kinds The *Alpha* tests for literates have formed the model for most subsequent scales, comprising seven separate exercises (including the already quoted "analogies' and "number series") with 212 questions, and a time limit, there were five equivalent forms of these tests The *Beta* tests for illiterates and the foreign-born depended upon non linguistic, graphic presentation Neither then nor subsequently have group test results been accepted as evidence of the subnormality of an individual, a low score would draw attention to the need for individual testing

[1] Op. cit., p 183.
[2] *Mental Tests in the American Army*, Yoakum and Yerkes.

MATHEMATICAL GROUNDWORK

Two other mathematical instruments had by then been added to the concept of mental age performance to make such developments possible

1 *The Theory of Correlation* was developed and extended to mental testing by Professor Karl Pearson and Professor Spearman in particular This made possible the mathematical demonstration of whether the results of one test showed any coincidence with those of another or with estimates otherwise obtained It has already been seen to what extensive discoveries it has led Spearman Its formulæ are explained in Par 3, Chapter XVII of this book

2 *The Curv of Normal Distribution* which had been found to hold for a large number of social and physical phenomena was first applied to mental traits by Sir Francis Galton, and was found to hold for what Binet had measured (see Part 3, Chapter XVII)

CRITERIA OF A GOOD TEST

The general criteria used in the early empirical stages of intelligence testing were that the results should show a satisfactory measure of correlation with other socially accepted measurements, such as school success, that the exercises or 'batteries' composing the scale should show high inter correlations among themselves, that successive applications of the same scale, or of different forms of it, after a time interval should yield a high *Reliability Coefficient*, and that on the whole the scores should show increase with increasing physical age.

Even scales based on no more than these precautions have found some success, owing to the general effect of pooling the results of a number of test items which tends to cancel out the *s* factors[1]

The following criteria will, however be observed by anyone wishing to confine his test to a pure measure of *g* free from this approximate cancellation of *s* factors

1 It will involve relation and correlate eduction from ideas already known in themselves It may be noted that nearly all

[1] Cf *Abilities of Man* Spearman pp 77 78.

the examples of the ten types of relations given in the last chapter were taken from intelligence tests

2 It will contain these unit-processes in a wide enough range of dissimilarity and in sufficiently large numbers to give a satisfactory average of success Thus most scales, including Spearman's own, give from about 150 to 200 items (some of which involve a number of eductions) and divide them into about seven dissimilar exercises

3 It will measure *g* in either of the quantitative dimensions of span, that is, in intensity or in extensity, or in both To measure extensity, some of the items must involve numerous fundaments requiring relations to be educed in considerable profusion within the same total mental operation. Some exercises therefore begin with simple units and work up to such complex items as [1]

> 'The Church lies a mile North of the Post
> The Bank is a mile East of the Church
> The Hall is a mile South of the Bank.
> How does the Post lie to the Hall?
> North? South? East? or West?"

4 It will ordinarily test *clearness* (i e intensity and determinateness) and *speed* of response in combination. The former characteristic, shown as accuracy or correctness, is always involved, and a speed limit is imposed for convenience sake in group tests, though not generally to the same extent in individual tests A moderate speed limit seems to work best. If the best candidates have to wait with time on their hands, they are not being given full opportunity to register their superiority

5 It will aim at reducing the reproductive process to a minimum. (In the American Alpha scale an "information" test was included, and such a question as *A windlass is used for—sawing, cutting, lifting, squeezing, pumping?*[2] demands the recall of previously acquired information)

6 It will involve as few specific factors as possible Tests with digits and spatial figures seem to correlate well with school results which involve these fundaments, but they probably involve a broad factor, as has been seen

[1] *A Measure of Intelligence* Test 7 Spearman.
[2] *Grey University College Group Scale* Exercise 4

7 It will be neither too easy nor too difficult for the candidate, for in the former case his errors, and in the latter his successes, will be too dependent upon chance to give a reliable estimate[1]

LIMITATIONS OF THE TESTS

Before passing to the uses to which 'intelligence' tests have been put, it may be well to point out their *limitations*[2]

1 They do not purport to test the *s* factors, so that they cannot give a complete picture of an individual's ability Of two intending teachers, both may score equally on such a test, and yet be of very unequal value in the teaching profession, one bringing to bear a marked *s* factor, say for graphic art, or for vocal music, which would distinguish a performance which in the other might be throughout on a mediocre level

2 They do not test the conative and emotional factors which go to make up character Thus they afford no indication of a person's *w*, *o* or *p* factors, they are too short and stimulating in their operation to require special consistency of purpose, or to show oscillation from fatigue, or to demonstrate lag Of the two candidates mentioned above as testing equally, one might prove steady, consistent and thorough, and the other totally unreliable '*Will-Temperament*" tests are still required to supplement tests of *g*

3 Lastly, such a test would naturally give no information about the physique or physical condition of a person, which would require a medical examination

OTHER TYPES OF TESTS

"*S*' *Tests* A large sphere of work remains to be done in the framing of tests which will give measures of some of the most significant *s* factors, whether separately or as wider *group factors* One such attempt may be mentioned here, namely, the tests of musical ability framed by *Seashore*,[3] exercises are given in a number of processes, such as estimation of time-

[1] *Abilities of Man*, p 207
[2] Cf. *A Measure of "Intelligence"* Spearman pp 2 3
[3] *Tests of Musical Ability*, Seashore.

intervals, pitch, timbre, rhythm, intensi
means of a series of gramophone records

Vocational Tests Similar efforts hav
vocational tests for special professions o
dike's tests for aviators, and tests for
and others

Achievement or Educational Attainme
attention at present, and attempts are be
tests, for example, of facility in the th
serve to indicate the *age* or *standard* p
Ballard [1] has done much spadework in th
scales, and so has Burt [2] who uses th
diagnosis of his cases Each country m
or else adjust others for the use of its ow

MEASUREMENTS USE

The different measurements which the
be summarized, for so far the Mental A
with Originally this had to be worked
to the number of items right, now a sc
each MA is generally supplied with t
obtained

The Intelligence Quotient (so named b
device of dividing the Mental Age by
thus

$$\frac{MA}{CA} = IQ$$

Suppose that a child of 10 years old is sh
a MA of 12, his IQ will be found thus

$$\frac{12}{10} = 1\ 20$$

But if the ages are reversed, the figures w

Originally normality was regarded as 1, but as IQ s are always taken to two decimal places it is customary to speak of it as 100

If through achievement tests the Educational Age (EA) can be found, an Educational Quotient (EQ) will be forthcoming, thus [1]

$$\frac{EA}{CA} = EQ$$

And if then EQ is divided by IQ, it will be possible to find the AQ, or the Accomplishment Quotient

$$\frac{EQ}{IQ} = AQ$$

This will show both whether the pupil is working up to his ability, and whether the teacher is doing the best possible with the material he has, if the average AQ is below 100, something must be wrong with the teacher s methods or with himself On the other hand, when he is labouring under the disadvantage of subnormal intelligence in his pupils, his reputation will be covered, for his results will be relatively and not absolutely assessed

Percentile Rating—Many testers are inclining to the use of the percentile rank rather than of the IQ as a measure On this rating the most intelligent is ranked as 100 the least as 1, the average man as 50 To say that a man s percentile rank is 80 is to indicate his superiority, only 20 per cent of the population being more intelligent than he, but with a rank of 20 intelligence is inferior, because 80 per cent are above and only 20 per cent below This rating can be applied to any selected population group (so long as it is based upon an unselected sample of the personnel which it comprises) It is commonly given for age groups, thus it is possible to find the percentile rank of a 10-year-old child among other 10 year-olds It is probably more useful for adults than the IQ measure it can be found for any particular race, profession or industry, it might, for instance, usefully be found for college students graduates or teachers Much testing however, must be done

[1] *Intelligence Testing*, Pintner, pp 81 821 *Educational Psychology* Sandiford p 321

to obtain reliable ratings It suggests the old concept of one in a hundred,' but its expression is reversed and fits better the American expression of " 100 per cent. efficiency

THE GROWTH OF INTELLIGENCE

The growth of intelligence has been a matter of much discussion There is general agreement that it is most rapid, or at any rate most obvious on any graphic scale, in the early years, a fact which coincides with the pattern of physical increase in size and weight The difficulty has been to determine the

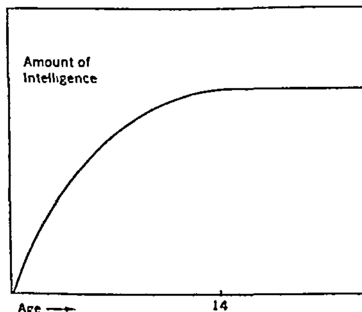


FIG 20

upper limit, some have put at the 14-year-old level of the Binet scales, others at 15 or 16 years [1] Yet common sense " persists in supposing a later growth and some psychologists are becoming less dogmatic, Pintner,[2] and G H Thomson [3] suggest that the scales are to blame, the latter thinks that they are based on so scholastic a type of test that they may be unable

[1] Cf. *Abilities of Man* Spearman p 375
[2] *Intelligence Testing* p 67
[3] *Instinct Intelligence and Character*, G H Thomson pp 221-25

to gauge any development beyond the school age, because they need to be either more subtle, or of a different type suited to the testees' subsequent experience Another suggestion is that

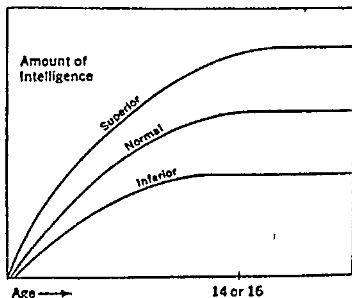


Fig 21

the super normal incline to develop in intelligence longer than others The accompanying diagrams from Pintner[1] illustrate these various views Fig 20 represents intelligence as more or less stationary after 14, Fig 21 as extending the duration of its

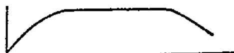


Fig 22

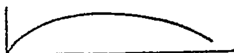


Fig 23

development according to its inherent superiority, Fig 22 as remaining stationary through the middle years and declining only in senescence Fig 23 as steadily developing towards a

[1] *Intelligence Testing*, Pintner pp 67-69

maximum in middle age and as steadily declining throughout old age

A further question arises from this discussion how far, if at all, can IQ be improved? The general answer is that there is little or no change in IQ—that, as Spearman[1] puts it, there are no "late-bloomers" He finds that the occasions quoted in which an improvement by a few points has been demonstrated are due to the removal of disturbing physical conditions such as adenoid growths

THE DISTRIBUTION OF INTELLIGENCE

Some of the most startling results of testing have arisen from the facts demonstrated about the distribution of intelligence in the population. The following figure, also from Pintner,[2] illustrates the matter simply

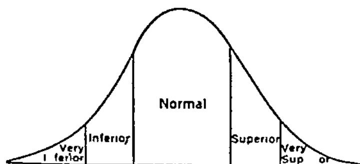


FIG 24 —Curve for Distribution of Intelligence.

A useful elucidation of the curve in terms of IQ (plotted on the horizontal axis) may be drawn from Burt.[3] In a large population about 2 per thousand would have IQ's about 150, and would generally be found in the higher professional, business or administrative ranks, about 2 per cent. have IQ s above 130, and 10 per cent. are over 115 About three-quarters of the population range between 115 and 85 Symmetrically 10 per cent have IQ s between 85 and 70, and may be described as "dull",

[1] Cf *Abilities of Man* pp 366-367
[2] *Intelligence Testing* Pintner, p 72
[3] *The Subnormal Mind* Burt pp 36-37 (He uses the term mental ratio for IQ)

about 1 to 2 per cent fall between 70 and 50, and are classified as feeble-minded, about 1 or 2 per thousand fall below 50 and are considered ineducable

USES OF TESTS

The uses to which the tests have been put cover a very wide range

In their application to school children they have been used for any of the following purposes [1]

1 Selection and promotion of children for higher grades, schools, colleges or scholarships
2 Classification into homogeneous class groups
3 Vocational and educational guidance.
4 Rating of schools and teaching by the introduction of the AQ
5 Comparison of differences in average IQ s for schools of varying type or class, or situated in different areas, for example, in town or country
6 Selection of the feeble-minded for special institutions or treatment
7 Selection of the super normal, who have in America also been segregated for special education in some experimental schools or classes, offering a deeper curriculum, the completion of two grades" in one year, or of three in two years
8 Detection of unfavourable conditions which prevent the child from working up to his mental capacity

They have also been used upon college students for

1 Admission tests
2 The formation of homogeneous working groups
3 Vocational guidance
4 Guidance in choice of subjects taken.
5 Stimulation to work to capacity
6 Research purposes
7 Detection of unf[illegible]

[1] Cf Intell[illegible]

Some other wider uses can be only briefly mentioned, such as the study of

1 Delinquency
2 Sex differences
3 Racial differences
4 Social differences
5 Mental inheritance
6 The Blind, the Deaf and their problems
7 Soldiers (as already discussed)
8 Vocational problems

It is not possible to touch upon the results of more than the first five lines of investigation, in addition to those concerning school children

EDUCATIONAL RESULTS

A somewhat surprising result has been the revelation of the vast *discrepancies of MA usually found in one class group* which has been approximately sorted on chronological age It has probably done much to weaken the faith of educationists in a horizontal class grouping which could be pushed forward yearly on the lock step' system The overlap between standards is amazing

The general effect of the horizontal system of classification according to age seems to have been a *levelling up process* Burt had as early as 1921 evolved a mathematical means of comparing mental ratio' (or IQ) and 'Educational ratio (or EQ) He found with a group of English elementary school children that

(1) 'the children who are most retarded mentally, appear still more retarded educationally , (2) with those who in intelligence, fall but slightly below the average, attaining ratios between 85 and 100, this tendency appears reversed There is discernible an effort, and an effort by no means sterile, to coax and coach these milder dullard to a grade more closely fitted to their actual age In this group alone acquired attainment is greater than inborn ability (3) Passing to those who are slightly above average, we find that the direction of the difference changes once more These children despite superior talent, are largely kept back

workers think that the percentage may not differ much from that for the rest of the population[1]

COMPARISON OF THE SEXES

Intelligence tests have given illuminating results which have probably been no small factor in the recent emancipation of women No significant sex difference in respect of *g* has been found, although the tempo of development would seem to vary slightly, Terman found boys ahead till about 8 years old, girls surpassing them between about 8 and 12 years Several investigators have drawn attention to the fact that males are found more numerously at both extremes of the curve, females more closely bunched around the middle or average, which is thought to be a possible explanation of the preponderance of notable men over women in history, though this would seem to be readily explicable on the grounds of social convention and educational opportunity

A few differences have been suggested in *s* factors, by some investigators females have been considered superior in colour discrimination, and in the memorizing of prose passages, males in puzzle tests involving the eduction of spatial relations and correlates, it is also suggested that the male sex has a greater tendency to perseveration[2]

RACIAL DIFFERENCES

These do not lend themselves easily to diagnosis by mental testing The work so far undertaken has been mainly on American immigrants for comparison with the white American population, this being one of the by products of the Army tests But language complications easily intervene, and immigrants necessarily form a selected group, usually from a more or less *restricted social stratum* Tests do, however, tend to show a superiority of North Western European stock over that of South East Europe

A comparison of white with coloured or negro stocks has been undertaken in America, where the same educational

[1] *Intelligence Testing* Pintner Ch XIII
[2] *Abilities of Man* Spearman pp 389-391

facilities are said to obtain for both populations Summing up the results of one such research, Spearman[1] writes On the average of all the tests, the coloured were about two years behind the white Another investigator confirmed this with college students, while another found that the superiority of the whites only began after the fifth or sixth year of life

On the other hand, however, the objection has been raised that, although the coloured and the white children may have been equal in respect of the education received at school they may still have been very unequal in respect of that received at home and in social intercourse Nevertheless such racial differences, even if truly existing, are indubitably very small as compared with those that exist between individuals belonging to one and the same race

The question is often asked whether intelligence tests can supply any measure of comparison between the European and Bantu populations of South Africa The answer is not until a test can be devised which will do equal justice to the widely divergent culture, education and language factors which separate the two races If, on the other hand, Fort Hare[3] students were taken as a sample, they would represent a highly selected group which could not be justly compared with the general white population or even with the white student population And it cannot be too strongly stressed that however medians may differ, the overlap will remain

DIFFERENCES BETWEEN SOCIAL CLASSES

These have been investigated with fairly consistent results, of which the following, quoted by Spearman from Haggerty and Nash as obtained from 8688 children of Standards III and IV (ages 9-14 years), are typical[4] The figures represent the median IQ s for children of these parentages

Professional	*Business*	*Skilled Worker*	*Semi skilled*	*Farmer*	*Unskilled Worker*
116	107	98	95	91	89

[1] Op cit pp 379-380 *Research* by S L. Pressey and Teter
[2] Op cit
[3] The South African Native College
[4] *Abilities of Man* p 38.

How much of these differences is due to heredity and how much to environment it is impossible to say[1]

The results go to show that the same standard of work cannot be expected from schools of differing social localities or standings

MENTAL INHERITANCE

All such studies throw considerable light upon the subject of mental inheritance, for which they have been largely used to supplement the case-history method One fruitful line has been the comparison of twins in respect of similar test performances with ordinary brothers and sisters. Thorndike and others have found correlations of ·70 to ·90, far higher than those obtained for ordinary siblings, which are usually about ·50, the surplus *cannot be accounted for by any greater similarity* of environment than would exist for other brothers and sisters, unless it be pre-natal, uterine environment.[2] Spearman sums up thus

"On the whole, the most reasonable conclusion for the present appears to be that education has a dominant influence upon individual differences in respect of *s*, but normally it has little if any in respect of *g*"[3]

There is little to be gained by enumerating the various tests in use, as their choice is generally determined by official sanction in countries and localities In Part III some general directions are given *which are applicable to the preliminary* practice needed for the administration of most standard group and individual tests

[1] Burt gives the average IQ of the professional man as about 135 (exceptional IQ s rising to 160 or 180), and the average IQ of the unskilled labourer as about 80 *The Subnormal Mind* p 37

[2] *Abilities of Man* p 383 *Educational Psychology* Starch, Ch. VI

[3] *Abilities of Man*, p 392

CHAPTER XI

SENSATION PERCEPTION IMAGERY ATTENTION

THE task must now be attempted of applying Spearman s cognitive laws to an analysis of the traditional "mental powers," with the object of making their pedagogical bearings apparent

SENSATION

In Chapter II the receptor organs were briefly reviewed physiologically as part of the *neural mechanism* The considera tion of their influence upon conscious life was deliberately left on one side for later discussion In Chapter IX the first noegenetic law was found to apply to the apprehension of *sentience*, among other types of *lived experience* The time has now come to examine the nature of this sentience which ' tends to evoke immediately a knowing of its characters and experiencer "

Obviously it can be aroused through any of the sense organs discussed, and each of these is the organ for a special kind or *quality* of experience, viz., for visual, auditory, olfactory, gustatory, tactile (with its four sub-divisions), kinæsthetic, static, and organic sensations These again are divisible into further grades which introspection is able to discern

> 'There appears to exist only one grade for pressure, warmth, cold and pain respectively, only four for taste, and perhaps a dozen or so for the visceral sensations Smell, on the other hand, is credited with about 500 grades Sound is divided into noise and tone, the grades of the former numbering some 600, those of the latter, no less than 10,000 Sight separates into chromatic and achromatic, the former having perhaps 200 grades, but the latter only two, namely, black and white Thus, the grand total may be taken at roundly 12 000 [1]

[1] *Nature of Intelligence* Spearman p 50

In addition to the character of quality, that of *intensity* can also be attributed to sensory experience A good deal of experimental work has been done and is being done to find the grades of intensity About 700 grades of brightness have been discerned, and 100 of loudness

Further, sensation varies in *duration*, the sounds of two bells, for example lecture and dinner bells, may give rise to quite different degrees of duration in sensory experience. Finally, it is equally obvious that there will be variations in *extensity*, the character of the sensation of ' redness " aroused by a red tie differs in extent from that aroused by a red dress at the same range.

The question then arises where are these differentiations made? What is the seat of the differentiating neural apparatus? In Chapter II it was made plain [1] that the nerve fibre itself transmitted only a *bare impulse*—a nerve-current of one and the same type by whatever receptor organ it might be released Thus the differentiation does not take place in the sensory organ itself, we do not, as it were, see *in the eye*, by a picture flashed on the retina All authorities are agreed that the differentiation takes place in the region of the brain concerned with sensory awareness which may conveniently be called the *Sensorium* James drew attention to the fact that,

> Whether we press the retina, or prick, cut, pinch, or galvanize the living optic nerve, the Subject always feels (i e sees) flashes of light, since the ultimate result of our operations is to stimulate the cortex of his occipital region',[2]

and he drove the point home by a memorable flight of fancy

> 'If, for instance we could splice the outer extremity of our optic nerves to our ears and that of our auditory nerves to our eyes, we should hear the lightning and see the thunder, see the symphony and hear the conductor's movements [2]

Before going further it will be well to review the seven stages which lead up to this first mental awareness or sentient experience [3]

[1] P 26 [2] *Text-book of Psychology* James p. 12
[3] For suggestive diagrams see *Nature of Intelligence*, Spearman p 42, and *Ability and Knowledge* Thomas p 132

1 There is the *object* present to the sense,—e g a tune, a tree, a fire

2 There is the *stimulus* [1] which impinges upon the sense-organs "The apparent greenness of the tree depends, not really on the tree itself, but upon certain movements of quite another external thing, namely, the ether in contact with the perceiver s eyes " [2] In the same way movements of other kinds conducted by other external bodies become stimuli to the awareness of sound, pressure, taste, smell, and so forth, and the movements and chemical processes of our own bodies become stimuli to kinæsthetic and organic sensation

3 These physical vibrations, finding entrance through the inlets especially fitted to receive them—such as the pupil of the eye, the ear passage, the nostrils—have power, through the specialized physiological mechanisms already described, to reach the appropriate afferent nerves—the retina, basilar membrane, mucous membrane—and to stimulate them to katabolic chemical changes, which release energy

4 The energy so discharged passes along the nerve fibres in a forward direction in the ways already described [3]—as a bare nerve-current or impulse [4]

5 This nerve-current produces a further katabolic chemical change in the appropriate area of the sensorium to which it is relayed So far the whole process has been at least potentially explicable in terms of physics and chemistry

6 There now comes the mysterious transition from a material to a mental event.

7 The mental effect is what is then known as *sensation* or *sentience* lived and experienced, rather than cognized

This brings us to the very portals of cognition To change the metaphor, the raw material of knowledge has been supplied (though by many stages removed from likeness to the *thing* or object itself), but not the knowledge itself By seven cog nitive events, of which the first five are also pre mental (that

[1] N B —The *stimulus* cannot be spoken of as travelling along the nerve fibres or carried to the brain.

[2] *Nature of Intelligence* Spearman p 37 [3] Pp 26-27 above

[4] N B —It is better to avoid fanciful expressions such as " The nerve carries a *message* "

is purely physical and physiological), the soil is supplied out of which cognition originally springs, by the further processes usually classed under the name of *perception*

PERCEPTION

The term *perception* has been used to signify[1] "the consciousness of particular material things present to the sense," or "the act of interpreting sensations in such a way as to give us a *knowledge* of external objects

This "consciousness" and "interpretation" would seem to be the outcome of *three phases* supervening upon the merely lived" sentience, which are all capable of analysis by the noegenetic laws

1 *The Apprehension of Sentience*—As has already been explained, by the first principle 'any lived experience tends to evoke immediately a knowing of its characters and experiencer," and this was found to include the experience of sentience It would appear that a certain minimum time, varying from one sense-modality to another, is required for the rise from obscurity to maximum intensity and determinateness of such experience, and, in the course of this, apprehension is able to supervene and effect cognition

2 *Eduction of Relations*—The items of experience thus brought to awareness by the first principle, at once proceed by virtue of the second principle *to evoke awareness of relations between themselves* This is the explanation of the familiar asseveration that we *perceive in wholes*, by the older school of psychologists these wholes were thought to be due to the *association* of sensory components, the modern Gestalt school is engaged in proving that the unity or *form* is an integral part of the original experience, a view which is more fully discussed in an appendix to this chapter The noegenetic view sees in such eduction of relations a fundamental mental process which supplies immediate, self-evident knowledge The relations so educed may be of any of the ten kinds enumerated in Chapter IX. Not only is material belonging to the same sense-modality so related, but

[1] Quoted by Sandiford in *The Mental and Physical Life of School Children* p 70

taste and smell blend their materials inextricably, as often do sight and touch, note, for example, the complex sensory experience involved in the apprehension of a sip of lemonade as such The constitutive relation seems to throw an integrating magic over all our sensory apprehension, so that two people approaching become at once a "pair,' two birds overhead a "brace,' apart from all the simultaneously educed relations of likeness and unlikeness, conjunction, space and so forth

3 *Supplementation*—The perceptual characteristics of recognition and interpretation cannot be fully explained without the consideration of a third phase which overlies the others Related apprehension of sentience is reinforced and supported by supplementation from either sensory or non sensory (metaphysical) sources

Sensory supplements amplify the necessarily incomplete and often much attenuated sensory data The sight of a straight edge supported at a certain height gives us confidence to place a book upon the unseen table top which it represents, the plane rectangular end or side of a matchbox is at once cognized as representing a rectangular prism, of known capacity Two steps are involved here first there is an associative reproduction (by an anoegenetic process) of the relevant relation (unseen top, sides, etc), secondly, this reproduced relation in conjunction with the given fundament (the visible part) immediately evokes a *correlate*, namely, the new set of parts, top, sides, etc, which are evoked to fit the visible part The processes may or may not be accompanied by imagery, that they are not merely reproductive is emphasized in the following passage [1]

'Lead the youngest schoolboy through the most unfamiliar scenes, take him to the most exotic fauna and flora in the Zoological or Botanical gardens, let him gaze at the most extravagant spectacles of the cinema, show him even pictures of monstrous fairy tales In not one single case will he be reduced to the necessity of appending to the actually sentient constituents of the percepts any *bare reproducts*—always more or less misfitting—from his own past experience The Japanese dwarfed tree is not obliged to appear as if having

[1] *The Nature of Intelligence* Spearman p 346

its rear face a hundred times too large, nor does the view from an aeroplane need to supplement itself with an interior as viewed in the usual manner horizontally"

This is the answer to those who in the past have endeavoured to explain all such interpretative supplementation as the result merely of associative reproduction, of *apperception masses* and so forth[1]

These sensory supplements are not confined to their own sense-modality, thus marble "looks' cold, hard and slippery, fruit "smells' sour

Metaphysical supplements —Percepts are further amplified by characters which are not drawn from sensory material, and may be grouped under the term metaphysical Of such a nature is our cognition of other human beings as conscious like ourselves, the interpretation of their looks and gestures, and our general perception of the social cues' which they afford Through correlate-eduction also we perceive inanimate or mechanical objects as such

Sometimes supplementation follows so hard upon the heels of apprehension of sentience as to be indistinguishable from it as a separate movement, this speed depends chiefly upon facilitation by practice, such closely linked supplements are often spoken of as *tied* notions Other items are more slowly presented in consciousness and are not so inseparably linked with the sentient characters, which are in fact capable of alternative supplements, these are known as loose or free' notions The two types are well exemplified in the processes of hearing the mother tongue spoken, when sound and meaning seem to introspection to be simultaneously aroused, and of hearing a less familiar language when meaning quite obviously halts after sound. Education is largely concerned with increasing the range and facility of the tied" notions by which our percepts are indefinitely enriched "What for one is no more than a 'Kodak' develops for the perception of another into a 'reflex, extension swing front, focal plane, anastigmatic, hand-camera de luxe'"[2]

After this discussion, a comparison of bare sensation with

[1] See Appendix I for an account of Association Psychology

[2] *Nature of Intelligence* Spearman p 257

perception is superfluous, the one would, for example, be responsible for mere sentience of certain sound waves, the other process for the awareness that the night train had just left the station with so-and so on board, well up to time, a clear air enhancing the stridency of its steam whistle

As for the question of whether a sensation is capable of being introspected apart from the percept which embodies it, this remains an open one The Gestalt school deny the possibility and refuse to admit any temporal priority in the arousal of the sensation Spearman does not despair of tracking the original conscious process by means of inference and of introspection along more searching experimental lines It is, however, true to say that by the time any sensory experience has reached a point at which we could attempt to analyse it, it has become a full-blown percept For practical purposes "pure" sensation is an abstraction

IMAGERY

The discussion of supplementation touched the fringe of another phenomenon that of the reproduction of previous sensory experience By the Law of Retentivity it has already been shown that the occurrence of any cognitive event produces a tendency for it to occur afterwards" *Image* is the word used for the revival or reproduct of a percept in consciousness Thus as many qualities of imagery are possible as of original sentience

> "There does not exist one single sensory character, whether qualitative, spatial or otherwise, but that the sensorium can evoke it in consciousness without any assistance at all from the sensory receptors, or even from the sensory nerves This is manifested in the fact, that there is no kind of thing or event cognizable by actual seeing, hearing, touching, or other perception that cannot equally well come to consciousness in dreams or in hallucinations' [1]

These wraiths from the past are no part of the original noegenetic activity of the mind Whether they appear as more or less true replicas of the past (as when the sight of the familiar breakfast table is recalled), or as the clothing of some fantastic

[1] *Nature of Intelligence* Spearman pp 42-43

unprecedented conception of the mind (as when every leaf on a tree appears to come to life as a winged monstrosity), their reproductive nature is the same What matters is whether they have arisen through mere associative reproduction, for example, by contiguity, whether they are the dress in which some educed relation clothes itself, or whether they are the outer garb of an educed correlate of perhaps far reaching constructive significance Images are the servants and not the masters of thought and memory, by the more pedestrian principle of association they are dragged one after another into the light of consciousness by the process of reproduction, in thought and imagination, so-called, they follow more or less upon the heels of the eductive flights

Before discussing the question of their necessity and incidence among mental activities and among individuals it will be well to compare these ghostly reproducts with the original percepts, for they are never mere replicas, otherwise great confusion would result The following points of difference are to be noted

1 The percept is usually more *vivid* and *distinct*, that is, it rises to greater intensity and determinateness, the image is comparatively vague, and lacking in the tang of actuality

2 The percept is more *durable* and *stable*, since the "object" is present to the senses the oscillations of attention are less apparent than in the image, which tends to flit to and fro unstably

3 The percept is more *complete* in its determinateness, whereas the image often lacks coherence and continuity, and is inclined to be schematic and fragmentary

To substantiate these three points, let the reader call up a visual image of a well known house, and notice whether he can from his image alone, count steps and windows, or tell the shape of chimney pots, he will generally find the process very different from performing these tasks whilst standing before the house itself

4 On the other hand, the *image is more directly under voluntary control* The percept is dependent upon the presence of the object, and cannot be directly inhibited or produced

5 The percept *moves and changes with our movement* and requires new fixations and adaptations of the sense organs in relation to our movement The image is independent upon our

movement, it is not localized Thus as one passes down a street the sight of a much-desired article in a shop-window may attract perceptual notice, and several back glances may extend this, but as one passes on, the image alone can be retained or recalled for further examination, and it may still be reproduced in the dark watches of the night

6 In the percept, since there is sensory activity, there is also the *muscular activity* involved in adjustment of the sense organ, with its kinæsthetic accompaniments, in imagery, so far as is known, the sense organ is not active, and yet there is generally innervation of the accessory apparatus, the student should introspect this in recalling images to order[1], it is especially discernible in switching from one image modality to another, for example from visual to auditory recall The kinæsthesis is, however, by no means so marked and definite as in perception

7 The percept is *confirmed and supported by its sensory context*, it is localized, fits into the scheme, and so bears the marks of actuality and *objectivity* The image, on the other hand, may be contradicted by its sensory context, and so remains recognizably *subjective* The image of the loved one may arise like a wraith but it takes up no space, compresses no upholstery

Attempts have been made to classify individuals according to the type of imagery which they mainly use, and Sir Francis Galton spoke of visiles, audiles, 'motiles and so on But such marked types seem to be rare, most people belong to a mixed type, and their bias can only be introspectively or inferentially detected For example, bad spellers are not usually strong in visual imagery, while if the faults are due to a phonetic rendering they would point to a greater use of auditory imagery On the other hand it is not safe to assume for instance, that artists are visiles, musicians audiles, actual sensory experience in one modality may be translated into imagery of another The case may be quoted of a student of weak graphic powers and crude perspective notions, but of brilliant musicianship, at once the idea arises that such a person has poor visual and excellent auditory imagery To the writer s surprise, her musical performance depended upon her visualization and she gave the following

[1] Experiment 4

account of a memorized concert performance of a long and intricate violin solo every note on the page stood out plainly in visual imagery, as she mentally turned from page to page, the picture was only disturbed by some external distraction, when kinaesthesis had to supply the gap, until the visual image could be recovered by lowering the eyelids

An interesting investigation is being carried on at Marburg by Professor Jaensch [1] and his collaborators on some characteristics of imagery He claims the discovery of a certain type of particularly vivid image which he calls an *eidetic* image After focussing upon a picture some subjects are able to image it visually either in its true colours, in the complementary colours, or in grey, the image may arise immediately or later In some cases it would seem as though a sensory after-image were retained, in others imagination plays more part and the image is revived as a memory image It is uncertain what percentage of children and adults possess these powers of imagery, apparently more of the former than of the latter

The further question of whether any people think without the use of imagery, but by bare "notional awareness," remains an open point for introspection It would seem that great individual differences exist

Pedagogically there seems a value in cultivating imagery in children by drawing attention to its use and supplying material, in art, literature and practical activities, for its exercise

So far a study has been made of sensory experience and its significance for knowledge either as a primary experience or as a centrally aroused revival It remains to be seen how far this knowledge gained through the gateway of the senses, can be regarded as reliable

Sources of error may be looked for from five quarters, namely from the construction of the sense organs themselves, from the apprehension of sentience, from the eduction of relations, from supplementation from the hallucinatory deception of images These will be briefly considered in turn

1 *Errors and limitations due to the physiological characteristics of the sense organs* (a) The afferent nerve-endings are only

[1] Described in *Eidetic Imagery* Jaensch 1930

sensitive to stimuli within certain ranges, and many sounds are too faint for human beings to hear which may yet be significant stimuli to other species, others are too "deafening", similarly, lights may be too dim or too dazzling. Each sense has its *lower limen* or threshold, and its *upper limen*, below or above which it is impervious to stimulation. Moreover, these limits not only differ, as may be inferred, in different species, but in some degree among the different races of mankind, and even from one individual to another.

(*b*) In the phenomenon known as *sensory adaptation* it would appear that physiological factors are involved apart from any question of relation educing. It is a matter of common experience that a person passing out of bright sunlight into a shaded room finds himself unable to see clearly until some time has elapsed for "dark-adaptation," and conversely on passing again into the sunlight, he finds himself dazzled for awhile, it would appear that not only does the pupil take time to expand or contract, but also a chemical change has to take place in the retina. The thermal sense seems also to undergo physical adaptation.

(*c*) There are also considerable individual differences in respect of the sense organs, not only in range and potency, but also in peculiarities due to more or less prevalent imperfections. Thus, if a subject is set to make one line equal another, either to right or left of it, he may be found to be fairly consistent in over- or under-estimation, which may vary again from right to left side, or according as it is viewed vertically or horizontally. Few people can agree about whether the pictures are straight, and most people in writing on unlined paper tend consistently to rise above, or drop below the horizontal. The same discrepancies exist in other senses.

(*d*) An interesting crop of errors concerns the visual organ only. The distribution of the rods and cones in the retina has already been noted in Chapter II. Little is known of the chemical and physiological factors which so link the red-green sensations and the blue-yellow, that the positive perseverating after images are succeeded by negative after images in the complementary colours[1]. These are not truly images at all, persistent sense

[1] Experiment 3

organ activity is responsible for them and they are more truly "after sensations" The mechanism of binocular vision provides further interesting possibilities of error which if noticed are usually discounted, whenever the eyes are not properly fixated, which is more frequently than might be supposed, double images appear There is probably also a physiological reason for the fact that vertical lines look longer than horizontal, so that unmeasured drawings of squares are seldom correct. Colour blindness may be looked upon as an abnormality, yet it is fairly common, and more so among men than among women, the red green cones are more often affected than the blue-yellow, which means not only that these colours cannot be sensed in their pure form, but also that they are as it were cancelled from every compound into which they enter

2 *Errors connected more specifically with the apprehension of sentience* are much bound up with *the problem of faulty relation-educing*, especially those which concern the *differential threshold* for sensation, which was the subject of much of the early laboratory work in psychology, the aim being to find the just perceptible differences which can be distinguished in each type of sensation. Results show that no hard and fast lines exist, but that errors of judgement grow more numerous as the differences between stimuli are reduced Moreover, the difference which can be perceived is relative, not absolute, that is, it varies according to the ratio which it bears to the stimulus with which it is compared, in other words sensation increases in arithmetical progression while the stimulus increases in geometrical progression This is the famous *Weber Fechner Law* Its operations are familiar in daily life, the morning sun "puts out" the stars, a pin can be heard to drop only when other sound is reduced to a minimum Further the ratio has been found to differ for different senses, for light the increase has been computed as 1 in 100—that is, the threshold of perceptible difference would be reached if one candle were added to 100 candle power, for warmth, sound and pressure it has been judged as 1 in 3, for lifted weight 1 in 10 These estimates are however, only approximately true, and are most valid for the middle ranges of sensation

Less concerned with mere apprehension of sentience, and more closely with the relations educed are the errors which arise from

failure to isolate the relevant factors sufficiently These are best illustrated from visual perception, though they are by no means confined to it. One of the most famous figures is the Müller-Lyer illusion which has been used in extensive researches, the subject judges by the total extent of the figures with the reversed arrow heads included, instead of detaching the bare enclosed lines for comparison, if he is required to make the lines equal in his estimation, or to judge from a number of presentations which pairs are equal, it will be found that his errors remain fairly constant in ratio The figures given below illustrate these points

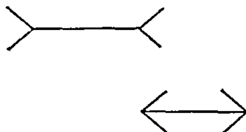


FIG 25—Despite their contrary appearance the two horizontal lines will be found of equal length.

The *size weight illusion* whereby a small round box for instance, seems much heavier than a large round one of the same weight (except to children, in whom the illusion is reversed) is partly accounted for by a similar explanation, though some characteristics of the pressure sense may complicate the comparative impressions from the kinæsthetic and visual senses

3 *Errors arising from faulty supplementation* are, however, by far the most significant and disturbing Errors of sentience tend to be discounted and not regarded as indicative of objective reality Errors of supplementation come from the central brain processes and have a more personal resonance

(*a*) The same kind of *anticipation* which facilitates correct perception time and again, may also be found to lead astray The rustling of the trees may be heard as the expected footstep, the shadow of the gate-post appears as the dreaded marauder, the white shaft of light as a ghost The difficulty of proof reading illustrates the sustained and ordinarily useful habit of reading into print what is expected to be there The same process operates to produce misinterpretation of correctly printed

matter, especially as it recedes further from the focus of attention, it becomes as it were distorted to fit the idea in the mind Recently, coming from a discussion on the relative advisability of regular teachers or visiting ministers for the religious instruction in schools, the writer s eye chanced to light casually upon a newspaper which immediately suggested the sub-heading Clergy Teachers ", this upon closer scrutiny resolved itself into ' Celery Trenches,' for it chanced to be in the " gardening notes ' column

(*b*) Overlapping this type of illusion at some points is that which arises from the *confusion of concept*[1] *and percept* A percept may give rise immediately to associative reproduction by resemblance, and this ideational reproduct may be superposed upon the percept and even oust it from apprehension Hence the difficulty which children find in drawing the aspect which an object actually presents to them, instead of the idea which it suggests to them, even some older people find great difficulty in drawing a board, placed horizontally slightly below their eye-level, as anything but a slanting rectangle, which apparently represents what they judge to be perceived

A word may be said on the subject of *empathy* which is considered to play an important part in æsthetic appreciation In discussing metaphysical supplements, it was noted that the social behaviour of one human being customarily arouses in another a train of associatively reproduced emotional and affective relations which become the basis of further correlate eductions whereby they are referred back to the arouser as an interpretation of his conscious states In early days men probably interpreted natural objects in the same way, which would account for the belief in animism, this again would be checked afterwards by the correlate eduction of *inanimate*, whereby the lack of vital response was interpreted as the ' opposite of conscious," so that objects came to be understood as unconscious ' Yet, when thinking is not checked by reason, moving objects such as waving trees and running water readily suggest animation. Hence when feeling and intuition are given full sway, pleasure is gained by allowing the false references to take place unchecked, so that

[1] I.e. any idea or item of cognitive content that by verbalization has become comparatively stable."

we *project* or *feel ourselves into* the contemplated objects, supplementing our percepts from both sensory and metaphysical sources, the mountain then looks grand and commanding, the sky lowering, the grass cool, the meadows happy, the ebb of the waves enticing, the cathedral tower aspiring, and the arches uplifting Our own feelings and emotions are reciprocally intensified by sympathetic induction The pathetic fallacy of the poets thus becomes explicable

Freud's explanation of mental bias has already been discussed, and his connexion of all misinterpretation with conscious or unconscious wishes noted It is easy to understand that such a delicate balance of objective and subjective factors as is concerned in perception may readily be thrown out of gear by the morbid wishes arising from absorbing complexes or from the bias of suggestion When some sensory context provides a more or less explicable cue for such distortion, the false percept still shares the title of *illusion* with its more normal counterparts, for it is the resultant of both present sensory experience and revived percepts which, as images, clothe the educed correlates

4 *Errors which arise entirely from centrally aroused images,* which seem independent of any appreciable sensory cue, are known as *hallucinations* They are errors of imagination rather than of perception The delusions of the paranoiac, which generally clothe themselves in auditory or visual images, are the extreme example *Pseudo-hallucinations,* which the experiencer recognizes as subjective, if only by the non participation of others, are liable to befall even the normal, thus the newly landed sea voyager sees the undulations of the pavement with perceptual vividness, but is not deceived It is possible that, as here physical causes can be discovered, so too in genuine hallucinations there may be, and certainly are at times, organic causes due to diseased or pathologically stimulated nerve-tissues

It is therefore not quite as easy as it would appear for the ' plain man ' to believe " the evidence of his senses

ATTENTION

The subject of sensory and revived sensory experience cannot be left without reference to the quantitative laws which govern

output it possesses two dimensions, those of *intensity* and *extensity*, in popular language, attention can be either concentrated or diffused [1]

Two questions arise from this which have been submitted to some experimentation (*a*) Are extensity and intensity rival dimensions so that mental energy spread over a wider field is necessarily weaker, and that restricted to a narrower scope capable of stronger effectiveness? (*b*) Do these characteristics represent *broad factors* so that some people are good "*diffusers*" throughout all their performances, others good "*concentrators*"?

(*a*) Experiments upon the *division of attention*,[2] in which after two simple tasks have been separately performed they are required to be simultaneously executed, show that they are seldom combined without loss of efficiency, sometimes more than half of the independent output for either or both tasks is accomplished, so that time is saved, in other cases there is actual loss of time compared with the total spell of successive performances If no efficiency is lost by combination, it is probably because both tasks are unified and performed in one rhythm, where some advantage is gained the subjects seem to resort to rapid alternation or to the partial mechanization of one task, or of both in alternate spells Results on the whole suggest that it is possible in some operations, and for some people, *to do two things at once*, but not apparently *to attend to two things* unless they are cognized as related to each other

(*b*) An investigation by McQueen,[3] in which five pairs of concentrative and diffusive tests (e g Tapping and Adding separately, and Tapping and Adding at the same time) were given to 40 schoolboys, gave no evidence of a *group factor* for concentration or diffusion when the collective results of both pools were submitted to the tetrad equation From this it would seem that there is no justification for the popular belief that some people can do concentrated work well but are weak at diffusive tasks requiring the same operations, instead the inherent mental energy can be directed into either dimension. But further proof is required in wider and more 'life-like' operations

[1] Op cit Ch. XV
[2] See Experiment 6.
[3] Op cit. p 363

2 *The Laws of Conative Control and of Primordial Potencies*

Spearman has paid little more than a passing reference to the *subjective factors* which (*a*) influence the *selection of items* for entrance into the strangely limited field of consciousness," and (*b*) *affect the clearness* with which they are cognized after entrance, although on the latter question some measurement has been done in regard to the influence of conation upon the efficiency of cognition *The Laws of Primordial Potencies* and of *Conative Control* stand for the basic facts of subjective and conative influences, but Spearman, by restricting himself to mathematical, and chiefly correlational, methods, is constrained to deal with questions of ' how much ? " rather than, at present, of " what sort ? ' McDougall sums up the position when he says

> " We cannot at present derive much help in this task from the results already achieved by the mathematical method, and it would be foolish and unduly timid policy to rely upon that line of work alone The mathematical method is and will remain only one among the many methods by which the secrets of the mind must be attacked, by which science will push forward into that dense jungle And it must always follow, rather than lead, the attack. If I may push the military analogy, I would say that its function is rather to clean up, define, co-ordinate, and consolidate the positions won by the skirmishers "[1]

The reader of Part I will need no more than a brief résumé of the factors which determine " attention " from the subjective standpoint

From *heredity* are derived (*a*) the propensities which ' determine the possessor to perceive, and pay attention to, objects of a certain class," varying in influence with their strength in any disposition, (*b*) the temperamental factors which are closely related to health and physical conditions, (*c*) the innate abilities which derive both from " *g* ' and from *s* ' factors And all these vary not only from individual to individual, but in broad general characteristics from race to race, and even in a measure from sex to sex, as well as being subject to developmental

[1] *The Energies of Men* p 96.

modifications with age From these inherent factors springs the spontaneous or *primary* attention which even young children are able to give to the objects of play and of "natural interest."

As *training* works upon these endowments, attention comes to spring less from the sporadic impulses than from sentiments which bring stable lines of interest capable of sustaining *secondary* attention in the face of difficulties which would damp the ardour of primary attention Developed systems of knowledge and belief come to control cognition in the interests of the conative and affective aspects of character Finally, it is the unified purpose of the master sentiment which becomes capable of sustaining attention in the face of all distraction, and thus conclusion joins hands with the discovery by Webb and the London School, through the correlation method, of a general character factor, designated *W*, and denoting '*consistency of action resulting from volition or will*'[1]

Moreover, the *immediate prevalence* of any of these factors of heredity and training seems an important determining condition for the reception of relevant items into consciousness, the prevailing idea, purpose, or mood all favour attention to items congruous to themselves

Much has been said about the function of *effort* in the control of attention and analyses have been made of the motor adjustments and the resultant strain which finally engraves its lines Its function has generally been regarded as including the inhibition of the irrelevant factors as well as the enhancement of the relevant

Everything, however, goes to show that mental energy is most effectively and least tiringly directed where it is spontaneously aroused by 'natural interests,' especially as these become organized But it would appear that initial effort, especially where a monotonous patch of work arises is often necessary for the *derived primary* attention which should grow from secondary motives Spearman's opinion, consonant with his belief in universal competition even between conation and cognition and based upon the experimental findings of E H Wild[2] is

[1] *Abilities of Man* p 348

[2] See *Brit Jour Psych* Vol. XVIII Nos 2 and 3 1927 28 and *Abilities of Man* pp 333 334.

that over-effort in some cases detracts from cognition, and that "in general, conation produces its effect mainly by directing the mental energy to the relevant processes When once this much has been achieved, the desired cognition ensues without effort."

3 *The Process of Clearness Variation*

Clearness Variation has already been dealt with as it results from subjective, conative factors It must be borne in mind that it is affected also by the *objective factors* which concern the stimulus The *intensity*, the *determinateness* or clearness, and the *duration* of the stimuli naturally affect the speed and degree in which items acquire clearness in the cognitive field As for the *pattern* of this clearness, all items seem to rise from complete obscurity to their own degree of clearness, and the general pattern of attention may be regarded in the same way That is, it may be regarded as a continuously sloping curve, like the curve of normal distribution widening not only at the base of manifest consciousness, but still more diffusively into sub-consciousness The apex in consciousness is higher and narrower as energy becomes more strongly concentrated, and hence applied to fewer items, lower and broader as it is more diffusively applied This probably presents a truer picture than analogies with levels or steps, or with concentric circles

The quality of clearness seems divisible into *intensity*, and *determinateness* or definiteness which follows more slowly upon its heels and also wanes more slowly For example, a highly-coloured and well illuminated picture rapidly gives rise to a maximum of visual intensity, whereas determinate impression of its features will follow more slowly [1]

Whatever the structural pattern of energy distribution, it must be borne in mind that the actual *content* of the field of consciousness as well as its clearness are in a state of perpetual flux

4 *O or Oscillation*

Oscillation is a characteristic of all our mental life [2] There is no such thing as a sustained and motionless attention This

[1] *The Nature of Intelligence*, Spearman, Ch. XI [2] Experiment 7

was first observed in the recurrent lapse from consciousness of barely perceptible stimuli (which may be tested with the tick of a watch held just within earshot), it may also be studied in the rival fluctuations of ambiguous figures presented to visual perception, which are seen to alter their perspective interpretation, for example, from concave to convex, and in the measurable fluctuations of work efficiency It is thought to be a factor dependent upon central fatigue and synaptic functioning McDougall's experiment with the windmill reversals in the study of temperament and drug effects has already been noted. It remains uncertain what the time length of these oscillations is or to what extent they follow a regular rhythm in individuals Some put them at about 2 seconds, some at 20 seconds, others think that these are two separate phenomena, some investigators see

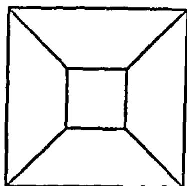


FIG 26—Reversible perspective figure

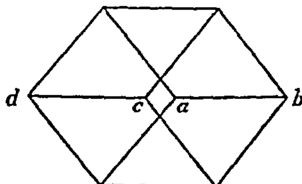


FIG 27—Ambiguous cube Either *a* or *c* can be made the focal point.

more importance in the *amplitude* of the wave of diffusion and concentration Further study may prove of the utmost value, it is not unlikely that many traffic accidents happen on the deep depressions of individuals whose mental energy may be

quite adequate in quantity but subject to useful heights and dangerous depths of oscillation.

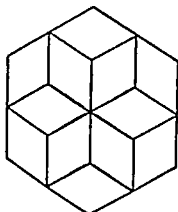


FIG 28—Ambiguous hexagonal figure, which can be seen in three or more ways

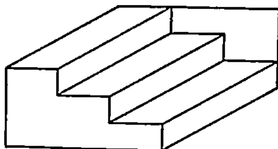


FIG 29—The ambiguous staircase figure

The application of these factors to the learning process will be considered more fully in the next chapter

APPENDIX TO CHAPTER XI

THE GESTALT VIEW OF PERCEPTION

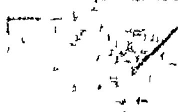
A discussion of perception would not be complete without further reference to the views of the Gestalt school. This school originated in Germany, and has been closely connected with Berlin University Its leaders are Professor Max Wertheimer Professor Wolfgang Köhler and Professor Kurt Koffka, who accepted a lectureship in America and carried the war against behaviourism nearer home. Its English interpreter is Professor R. M. Ogden.[1]

Gestalt is a German word usually translated into English as *form* or *shape* it has been the fashion in psychology to render it as *configuration* but in *Psychologies of 1930*[2] Köhler rejects this as too suggestive of

[1] The chief works published in English are *The Growth of the Mind* Koffka trans Ogden 1928, *The Mentality of Apes* Kohler 1925 (original edition 1917) *Gestalt Psychology* Kohler 1930 *Psychology and Education* Ogden 1926

[2] Ch. VIII Some Tasks of Gestalt Psychology

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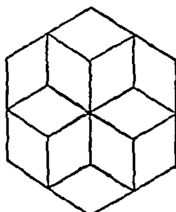


Fig 28 —Ambiguous hexagonal figure which can be seen in three or more ways.

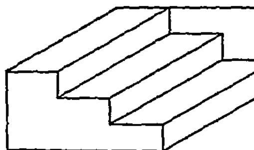


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[2] Ch. VIII Some Tasks of Gestalt Psychology

elements put together in a certain manner" and prefers the word *form* which, it has been suggested might yield the generic term *formalism*.

Gestalt psychology is a revolt against two different but allied theories. *First* it girds against the older doctrine of perception as a secondary process built up out of separate sensation units *Secondly*, and this side will be dealt with in the next chapter it takes the field against the behaviourist theory of Trial and Error learning as built up out of separate stimulus response units In other words it is an enemy of *associationism* as an explanation either of subjective experience or of objective behaviour In substantiating its own views it probably exaggerates the lack of fusion suggested by both opposing doctrines

Some of the most characteristic perceptual researches of the Gestalt school have been in the visual field whence they have been carried over by analogy to other fields In contrasting his view of the fundamental unity of experience with the idea psychology [1] of the last century Kohler describes [2] this old *element sensation* psychology as like the analogy of two rooms connected by a number of tubes and pipes, into which water in one room can be pressed so that jets of water can pass separately out of each pipe into separate receptacles Whereas the Gestalt conception could be better likened to a network of wires, two points of which can be connected with two poles of a galvanic battery, as soon as a current is passed through there is a stationary distribution in the net in the connecting wires and in the battery Thus although local areas may be especially affected, any change is dependent upon the dynamic equilibrium distribution of the whole and the total process must obey one law for it as a whole

Koffka in the *Growth of the Mind* is concerned to prove that this theory of the wholeness of mental experience is supported by the facts of *ontogenesis* as well as by a comparative study of animal behaviour James had asserted that The Object which the numerous inpouring currents of the baby bring to his consciousness is one big blooming buzzing Confusion That confusion is the baby's universe [3]—that is, until it can be perceptually disentangled. Koffka asserts on the contrary that the most primitive phenomena are *qualities or figures upon a ground*, that is they are *configurative* They arise not in isolation, but in relation to their background. Some of his arguments in support of this contention are that [4] (*a*) The infant does not behave as though at the mercy of an abundance of mental stimuli. On the contrary he has a great capacity for sleep and reacts more slowly than the adult. (*b*) It is not simple stimuli which first arouse his reaction and interest instead by the fourth or fifth month he can differentiate the friendly or scolding tones of the human voice he soon responds to the human face and by

[1] See Appendix I

[2] *Psychologies of 19 5* ed. C. Murchison Ch III *An Aspect of Gestalt Psychology* pp 163 166

[3] *Text book of Psychology* p 16

[4] *The Growth of the Mind*, Ch. III

six months old is influenced by facial expression (c) When our own attention runs low through fatigue or o her causes our experience approximates towards an inarticulate monotonous unity and not to bedlam (d) Results of experiments on animals and children further prove the point that primitive impressions are relative rather than absolute Thus Köhler trained a child to find candy in the brighter of two boxes until forty five trials had eliminated errors he then presented the right box with another as much brighter than it as it was brighter than the originally presented wrong box, the child showed no hesitation in choosing the new brighter box showing how little he had depended upon the *absolute* brightness

Thus Koffka asserts that simple configurations are primitive modes of behaviour which in no wise presuppose the existence of absolute sensations And he concludes The nature of mental development as it has been revealed to us is not the bringing together of separate elements but the arousal and perfection of more and more complicated configurations

It may, however be questioned whether any theory can forbid subsequent analysis into elements if it is to pass from the merely descriptive to the explanatory stage

The general pedagogical bearings of such a view confirm the abandonment of the old synthetical methods which began by building up reading on the alphabet, writing on pot hooks arithmetic on table-drills and music on five finger exercises, they point instead towards an approach through wide if vague unanalysed wholes such as the sentence method in reading the Montessori method of writing number games in arithmetic, and rhythmic interpretation in music.

CHAPTER XII

THF LEARNING PROCESS (I)

INSIGHT AND TRIAL-AND-ERROR

IN this and the following chapters the problem of learning will be considered in the two fields of sensori motor and of ideational learning

Sensori motor learning is concerned with the making of *new connexions between perception and movement*, such, for example, as are involved in learning to steer a motor-car through traffic.

Ideational learning is concerned with the development of the mental processes which intervene between perception and action, the would be motorist who returned after a trial run to study the highway code would be engaged in ideational learning

The concept of learning itself presents some problems. It falls into three main divisions

1 *The Problem of Achievement* —How do new modes of adaptive achievement become possible in the first instance? For *learning takes place during the process of achievement'*,[1] it is in this process that those traces are formed which make subsequent reproduction and recognition possible.

2 *The Problem of Retention* —This seems to be mainly a physiological problem What is the career of the traces (or engrams) between the time of their formation and of recall?

3 *The Problem of Facilitated Recognition, or Reproduction*, of the learnt behaviour How is it that the subsequent performances show improvement?

The question arises How much of the third reproductive side in the two above named fields is to be classified under *memory*,

[1] *Energies of Men* McDougall, p 339

and how much is to be regarded as more appropriately termed *skill*, *habit* or *knowledge?*

The customary usage is to reserve the word *memory* for such recalls or recognitions as carry with them the hallmark of localization, i.e *the remembrance of them as having occurred in the subject's own past experience* Sometimes the word is reserved for this kind of recall of *ideational matter only*, but there is no reason why a person should not have explicit memory of how to knit a sock or solve a maze The fact is, that if the *recall* is to be of the explicit sort defined above, it must be an *ideational recall*,—though it may be a recall of experience from either of the aforementioned fields The mere facilitated *doing* of the act is better not spoken of as *memory*, but the *knowing how to do it again* (plus the local reference to the past) may well be called an *act of memory* And this requires more or less explicit formulation in word or thought The animals cannot give us direct evidence of this, although we may infer a similar state of mind in them at times from their behaviour or facial expression, young children soon become capable of expressive indications

In this and the next chapter, therefore, learning will be treated from the standpoint of *adaptive achievement which issues in facilitation without explicitly localized recall*, and this will most clearly be studied in the field of *sensori motor learning*, the effects of *practice* upon an already known performance, of *transfer* or carry-over of training from one operation to another, and of *fatigue* upon practice and performance, will then be discussed

In Chapter XIV *memory proper* will be considered, in the sense of *definitely localized recall*, and to avoid overlap it will deal mainly with the memorizing of material from the *ideational field*, this will also be considered from the standpoint of *committing to memory* as well as of *recognition and reproduction* Finally, some recommendations will be given for economical learning

SENSORI MOTOR LEARNING

The chief battle of the rival schools of psychology has been fought upon the field of animal learning, so that some accounts will be given of different types of animal experiment, in historical

order, with the views advanced to explain them, after which a critical summing up will be attempted

ANIMAL EXPERIMENTS

One of the first animal experimenters was Thorndike, who made systematic observations as early as 1896[1] Brief accounts of three examples of his methods will be given because they have furnished, as he intended, the models for most subsequent experiment in a certain type of laboratory work.

1 *The Learning of Fishes*[2]—The common Fundulus was studied in an aquarium 4 by 2 feet with water 9 inches deep, one end of which was shaded with a cover and used also as the feeding end. As a fish swam up to the other end, partitions of wood, glass, or wire were interposed between him and the shaded end, each screen having an opening in it at the top right hand corner (followed later by other screens with differently placed openings) After bumping against the screen here and there and swimming up and down it, the fish would arrive at the opening and swim through After some repetitions the fish learnt to get through and return to the shade without hesitation

2 *The Learning of Cats*—More famous is Thorndike's experiment with the escape of young cats from puzzle boxes Thirteen cats were used, known by numbers, and fifteen different boxes, (generally 20 × 15 × 12 inches) with bars in front, and bolts, bars, latches and buttons of increasing complexity fastening them on the outside, some attached to strings, loops or levers on the inside, others to be worked through the bars

> The animal was put in the inclosure, food was left outside in sight, and his actions observed Besides recording his general behaviour, special notice was taken of how he succeeded in doing the necessary act (in case he did succeed), and a record was kept of the time he was in the box, before performing the successful pull, or clawing, or bite So far as possible the animals were kept in a uniform state of hunger, which was practically utter hunger [3]

[1] *Animal Intelligence* 1911 p 29
[2] Op cit Ch. IV
[3] Op cit pp 24 25

The following is Thorndike's account of the behaviour of any one of eleven of the cats

> It tries to squeeze through any opening, it claws and bites at the bars or wire, it thrusts its paws out through any opening and claws at everything it reaches, it continues its efforts when it strikes anything loose and shaky it may claw at things within the box It does not pay very much attention to the food outside, but seems simply to strive instinctively to escape from confinement The vigour with which it struggles is extraordinary For eight or ten minutes it will claw and bite and squeeze incessantly The cat that is clawing all over the box in her impulsive struggle will probably claw the string or loop or button so as to open the door And gradually all the other non successful impulses will be stamped out and the particular act will be stamped in by the resulting pleasure, until, after many trials, the cat will, when put in the box, immediately claw the button or loop in a definite way "[1]

Time curves differed considerably,[2] Cat 12 for 24 trials in Box A took 160, 30, 90, 60, 15, 28, 20, 30, 22, 11, 15, 20, 12, 10, 14, 10, 8, 8, 5, 10, 8, 6, 6 7 seconds (an interval of 24 hours occurring after the tenth trial)

> 'The extreme of ease is reached when a single experience stamps the association in so completely that ever after the act is done at once This is approached in (boxes) I and E [3]
>
> 'Attention, often correlated with lack of vigour, makes a cat form an association more quickly after he gets started No 13 (an old cat) shows this somewhat The absence of a fury of activity let him be more conscious of what he did do [4]

For the last box Z, the door was opened as soon as the cats happened to lick themselves, or in later trials to scratch themselves After the cat gets so that it performs the act soon after being put in, it begins to do it less and less vigorously The licking degenerates into a mere quick turn of the head with one or two motions up and down with the tongue extended Instead of a hearty scratch the cat waves its paw up and down rapidly

[1] Op cit pp 35 36
[2] Op cit. p 38
[3] Op cit p 46
[4] Op cit. p 46

for an instant. Moreover, if sometimes you do not let the cat out after this feeble reaction, it does not at once repeat the movement, as it would do if it depressed a thumb piece, for instance, without success in getting the door open. Of the reason for this difference I am again ignorant."[1]

3. *The Learning of Monkeys*.—Experiments were made with monkeys in similar but more complicated ways. They were studied

"in learning to get into boxes, the doors of which could be opened by operating some mechanical contrivance, in learning to obtain food by other simple acts, in learning to discriminate between two signals";[2] further, experiments were made upon the influence of tuition, and of imitation both of human beings and of other monkeys. The general upshot was "that the only demonstrable intellectual advance of the monkeys over the mammals in general is the change from a few, narrowly confined, practical associations to a multitude of all sorts."[3]

Summary, and Explanations Offered.—Perhaps the greatest value of these experiments lay in the example and incentive which they have provided, for Thorndike's challenge has been accepted in many quarters:

Surely every one must agree that no man now has a right to advance theories about what is in animals' minds or to deny previous theories unless he supports his thesis by systematic and extended experiments. My own theories, soon to be proclaimed, will doubtless be opposed by many. I sincerely hope they will, provided the denial is accompanied by actual experimental work.'[4]

The characteristics emphasized by Thorndike in these learning operations are:

1. The acts required are all part of the innate equipment, but a new connexion has to be made with a given situation.

2. The appetitive state of the animal (in the broad sense, covering hunger, loneliness, etc.) is regarded as essential.

3. Learning arises out of the restless natural activity of the animal subject.

[1] Op. cit., p. 48.
[2] Op. cit., p. 240.
[3] Op. cit., p. 176.
[4] Op. cit., p. 54.

4 The solution first arises through a *happy accident*

5 "Associations" are then formed which facilitate the subsequent response

In answer to the question *how* the last result is accomplished, two laws are given

1 *The Law of Exercise*

> Any response to a situation will, other things being equal, be more strongly connected with the situation in proportion to the number of times it has been connected with that situation and to the average vigour and duration of the connections' [1]

This is the *Law of Frequency* which thorough going behaviourists, with the help of the *Law of Recency* (the right act always being performed last), would use to cover the whole phenomenon of learning Thorndike denies its adequacy to cover the whole field, because, as he points out, the right act is not always the one most often repeated, for though it must occur on every occasion for success, it necessarily occurs only once at each trial, whereas a wrong act may occur many times during the same trial, he notes how one monkey repeated a wrong action thirteen times in succession, if only the law of exercise operated, learning would not be adaptive [2] Thorndike therefore supplements this by

2 *The Law of Effect*

> Of several responses made to the same situation, those which are accompanied or closely followed by satisfaction to the animal will, other things being equal, be more firmly connected with the situation, so that, when it recurs, they will be more likely to recur, those which are accompanied or closely followed by discomfort to the animal will, other things being equal, have their connections with that situation weakened, so that, when it recurs, they will be less likely to occur The greater the satisfaction or discomfort, the greater the strengthening or weakening of the bond [3]

The other things that have to be equal in the case of the law of effect are First, the frequency, energy and duration of the connection,—that is, the action of the law of exercise, second, the closeness with which the satisfaction is

[1] Op cit. p 244 [2] Op cit p. 271 [3] Op cit. p 244

associated with the response and third, the readiness of the response to be connected with the situation [1]

The first serious critic of Thorndike's experiments was Hobhouse

Hobhouse[2] continued to experiment under natural conditions with pet animals, and to demonstrate the scientific justification of a quite different method of observation. His subjects were mainly his cat, Tim, his dog, Jack, a Zoo elephant, Lily, a monkey, Jimmy, and an otter, Billy The experiments conducted required them to pull strings for food, lift covers from over it, open boxes of all sorts, find food in particular drawers, and so forth The aim was to find out 'whether animals can learn by perception of results (as distinct from 'imitation' in the usual sense), [3] and not merely by motor acquisition, or doing the act To this end use was made of suggestion (which "consisted in pointing to the object to be attacked by way of reminder")[4] and of encouragement and discouragement He discusses Thorndike's failure to find learning by 'perceptual imitation,' and draws attention to the fact 'that an animal makes *no intellectual provision for the future*,"[5] so would not watch another on the assumption of future utility, also there is the great difficulty of *securing the attention of the animal to the relevant features*, whilst preserving the affective basis for action intact,[6] thus the dog, for instance, jumps and snuffles when the food is being reached for him instead of watching the relevant actions Hobhouse notes that the method of learning demonstrated did not ordinarily 'conform to the notion of the gradual growth or inhibition of a habit, it conforms rather to the rise of an idea, at first dimly grasped, then clearly seen, for a while waveringly held, but soon definitely established [7] Also that 'the more a success was accidental the less likely were the animals to take advantage of it' [8] He makes no claim to proof that the animals learnt by perception of what was done by the experimenter

[1] Op cit, p 248
[2] *Mind in Evolution* 1901 Ch. VII and VIII
[3] Op cit. p 152
[4] Op cit. p 154
[5] Op cit., p 149
Op cit. pp 148 and 207
[7] Op cit p 206
[8] Op cit. p 202

Köhler made extensive studies of a group of chimpanzees on the island of Teneriffe, and has published a particularly fascinating account. The experiments were designed to depend upon *insight* and to avoid *chance* solutions They were concerned with the problem of *achievement* rather than with that of facilitation "The experimenter sets up a situation in which the direct path to the objective is blocked, but a roundabout way left open The animal is introduced into this situation, which can, potentially, be wholly surveyed, and so we shall be able to see up to which level of behaviour its capabilities take it." [1] The measure of insight was judged to be the animal's capacity to select the indirect way unaided The experiments were so planned that he required no knowledge of human contrivances Thus he could observe the problem, and not, as Thorndike's cats, have to deal with bolts and fastenings invisible from the inside of the box

The tests included the use of implements, such as sticks for reaching food, the making of implements, such as the breaking of a branch off a tree, the jointing of bamboo sticks to the required length the building up of boxes to climb on in order to reach fruit hung from the roof, culminating in the poking of fruit from a detour board made like a drawer with an open end away from the animal so that the fruit had to be pushed away before it could be retrieved

Some extracts will best convey the general style and setting of the test performances In the early tests of reaching for fruit with sticks, on occasions when no sticks were available, Koko [2] "employed a large piece of stiff cardboard, a rose branch the brim of an old straw hat and a piece of wire" On another occasion when the sticks were at a distance and unnoticed,

> Tschego jumped up, went quickly into her sleeping-den, which opens into the cage, and returned at once with her blanket She pushed the blanket between the bars, flapped *at the fruit with it, and thus beat them towards her When* one of the bananas rolled on to the tip of the blanket, her procedure was instantly altered, and the blanket with the banana was drawn very gently towards the bars" [3]

[1] *Mentality of Apes* p 4
[2] Op cit. p 36.
[3] Op cit p 35.

The following account of a more difficult solution is quote from Koffka's version for the sake of brevity

> Unusually impressive was experiment No 11 with tw sticks that could be fitted together It was the cleveres animal, Sultan, who was here tested, and even he depende for his success upon the aid of chance For over an hou Sultan had laboured in vain The experiment was the given up and Köhler departed Sultan, however, retaine the two bamboo sticks, and the keeper remained at his post It was the keeper who observed the animal, first sitting upo a box which stood near the bars then rising picking up th sticks, and after reseating himself on the box, beginning t play with them aimlessly While doing this, it happens tha he finds himself holding one rod in either hand in such a wa that they lie in a straight line, he pushes the thinner one little way into the opening of the thicker, jumps up and i already on the run towards the railings, to which he has up t now half turned his back, and begins to draw a banan towards him with the double stick I call the master mean while one of the animal's rods has fallen out of the other, a he has pushed one of them only a little way into the other whereupon he connects them again' So runs the report o the keeper and Köhler himself arrived in time to see the res of the animal's performance of refitting the sticks togethe and securing the fruit After his first success Sultan repeate the act a number of times without stopping to eat until h had drawn into his cage, not only all of the fruit, but also a number of other things He appeared to enjoy the act an he retained the method of solution so well that on the follow ing day he was able to construct a still longer stick from thre bamboo stalks Although Sultan's solution depended upo the help of chance chance operates here quite otherwise tha it does in the experiments described by Thorndike, for i was not chance that led to the goal nor did chance provid a practicable tool, instead it was the chance-situation whe the two sticks were in line with each other, that favoured th correct solution [1]

Köhler takes for evidence of *insight* in these experiment primarily (i) The appearance of a complete solution wit reference to the whole lay-out of the field thus only tha

[1] *Growth of the Mind* pp 217 218

behaviour of animals appears to us intelligent which takes account from the beginning of the lie of the land, and proceeds to deal with it in a smooth, continuous course.[1] Hence (ii) the solution 'often follows upon a period of perplexity or quiet (often a period of survey), but in real and convincing cases the solution never appears in a disorder of blind impulses.'[2] The best and most obvious solutions often occurred suddenly, after the animal had been quite helpless at the beginning of the experiment, and sometimes for hours after.[3] Indeed, the solution sometimes seemed to come when the animal was not in the presence of the problem and hastened back to it. (iii) Learning of this kind shows little or no dependence upon repetition for its success. Of the experiments practically none is performed twice over in the same way; indeed the movements by which one single one is performed vary very much.[4] Moreover, other variations arise directly through unforeseen circumstances (such as the roughness of the ground) in the execution, and cannot possibly all have been rehearsed; yet these are manipulated on each occasion. (iv) The animals did benefit upon some occasions by being shown how to do a thing; they imitate so long as they understand the action to be imitated, have reason to watch the model with interest and so gain insight into a solution for which they are searching.

McDougall has performed experiments both under laboratory conditions and under the natural conditions of tame or captive animals.

Rats—Learning to Escape from a Tank by means of *sh k* and *signal*. For some years McDougall has been carrying on an investigation on the Lamarckian hypothesis which has involved the training of rats to escape from a tank half full of water; they are put in at the central gangway the lower end of which opens into two similar routes of escape to right and left, one of which, D, is the harmless one, while the other, B, is brightly lit and carries an electric current. B and D exchange positions at each

[1] *Mentality of Apes*, p. 198.
[2] Op. cit., p. 225.
[3] Op. cit., p. [illegible]
[4] Op. cit., pp. [illegible]

immersion of the rat The following account is a by product of this investigation

"The learning, the solution of escape from the water without getting the shock, is not achieved as a gradually increasing preference for route D shown by an increase in the number of times D route is taken relatively to the number of times B is taken Most of the rats continue to take B as often as D during many repetitions of escape And after receiving the shock on B many times (varying with the rat from 30 to 300) a marked change of behaviour is manifested Instead of rushing recklessly at either B or D as hitherto, the rat pauses at or about the spot C (end of alley), looks at B, perhaps approaches B cautiously, turns about, looks at D, and perhaps repeats several times this alternate looking at B and D It is a phase of hesitation of uncertainty, one is tempted to say, a phase of deliberation before action Such deliberation is the beginning of wisdom It seems to imply a conflict of two impulses, the impulse to escape from the water by any route perceived and the impulse to avoid and retreat from the shock-giving gangway He takes B once again, or perhaps twice or thrice, and then he discriminates. Thereafter he makes no more errors, but takes every time the route D And, when this stage has been reached, it becomes very difficult to trap him into making an error For example, if at the very moment he is approaching D, the current is switched over, so that D becomes B (that is, becomes brightly lit), the rat will promptly turn about and swim round to the other gangway, now D, and he will do this again and again [1]

Box Opening with Tuition—A further experiment with a box is instructive A white rat was used, and a wooden box with hinged lid and food inside, a series of wooden catches or latches, each pivoting on a single screw, secured the lid, one latch was introduced at a time and when the rat had mastered that another was added, making an interlocking series of fourteen in all—all of the same type

"The hungry rat, attempting to raise the lid, was at first baffled, but he persisted in pushing and pulling at various points of the lid until he *happened* to move the latch He

[1] *Energies of Men* p 364

then raised the lid On repetition he quickly learnt to go at once to the latch and to push or pull it, as soon as he found the lid resist his thrust Now a second latch (L_2) was attached pivoted in such a way as to hold L_1 in position Again the rat attacks the problem, pushes and pulls at L_1 with teeth and paws, but in vain Can he be taught by showing him how to move L_2? After he has struggled vainly for some time, we push his nose or his paw gently against L_2, thus releasing L_1, and leave him to his task He quickly pulls down L_1, and obtains his food After a few repetitions of this teaching-process, he quickly deals effectively with L_1 and L A third latch is then added, locking L_2 and L_1 Again the rat struggles in vain, again he is taught by the same gentle method, and again he quickly learns From the seventh latch onward, the rat needs no assistance, no guidance, he deals effectively with each new latch, mastering it within a very few seconds of the outset of his attack on the box In the course of his dealing with the earlier members of the series of fourteen latches he has acquired such *understanding* of simple pivoted latches of this sort that they present no difficulty to him, he masters them almost immediately His facility becomes so great that he opens the whole series of fourteen latches in about three seconds, repeating this again and again with sure deft movements and moving so rapidly that the eye can hardly follow But sometimes he is a little careless, and fails to move a latch far enough then he attempts to raise the lid and finds it fast, at once he runs back to L_{14} rapidly reviews the latches, finds the one on which he fumbled, opens it and the remaining latches up to L_1, and so obtains his food [1]

A *racoon* quickly learnt to master 24 such interlocking latches *without assistance*, and could open them in a few seconds

Both rat and racoon learnt to haul on a string to secure a bone, shown first, and suspended from the front of an open cage

" The rat leans out of his cage and seems on the point of falling out in his vain effort to reach the dangling bone Then, after a few seconds, he seizes the string with his fore paws and hauls in the bone, paw-over paw He repeats this many times, varying his method but seldom failing to get the bone Sometimes he takes the string in his teeth and runs backwards [2]

[1] *Energies of Men* pp 61-63 [2] *Op cit* pp 65-66

SENSORI MOTOR LEARNING IN HUMAN BEINGS

The non behaviourist schools may support their objective studies by the introspective reports of human subjects confronted by similar problems, puzzles or mazes, which in some cases are attempts to reproduce the conditions of the animal experiments which allow for least insight [1] McDougall suggests the blind fold tracing of a maze with metal walls with a pencil point The subject would seek a way out, and would vary his move ments, which would, however, be relatively random and blind, he would note relevant relations especially place relations, and he would be influenced in subsequent repetitions by feelings of rightness or wrongness, encouragement or discouragement

ANALYSIS OF SENSORI MOTOR LEARNING

McDougall sums up his views of animal or human learning under five essential factors, viz.[2]

1 *Desire or impulse towards the goal*
2 Relevantly selective insight
3 Foresight
4 *Pleasant or unpleasant feeling*
5 Retentiveness

The first four of these factors concern the *problem of achievement* and this side of learning will now be considered critically with a view to drawing together the common testimony of the examples studied into some integrated explanation

1 *The Law of Conation* has already been studied both in its effect upon conduct through the powerful innate propensities, and in its effect upon cognition, through its indispensable im portance in directing mental energy to the relevant subject Thorndike himself emphasizes the importance of an instinctive motive when he carefully regulates the hunger of his cats McDougall never ceases to stress the prime significance of the goal seeking nature of all striving Hence it may be agreed

[1] *Cf Experiment 8 on Mirror Drawing*

[2] *Energies of Men* p 359

hat learning is dependent upon the directed striving which keeps the attention riveted to the objects which innately, or derivatively, attract it through inborn propensity, or other primordial potency

2 *The Eduction of Relevant Relations* must next be considered Thorndike used the explanation of 'associations, physiologically considered, yet he impartially notes how his old and inactive Cat 13 seemed in the long run to attend better and form associations more quickly because "the absence of a fury of activity let him be more conscious of what he did do, which seems hardly consistent with his theory of motor learning Hobhouse[1] finds the basis of the whole process of practical learning to be a *perceived relation*—as distinct from a mere association by habit, and he claims that the relation between act and consequence may be experienced without leading to the formation of a habit, and it may be applied in circumstances differing from those in which it was originally perceived Thus, too, McDougall writes Achievement of insight is, then, the perceiving of relations of one sort or another Of all relations those of space are of the most importance for the guidance of our movements and we may confine our attention to them, merely noting that many forms of perception involve other relations such as those of order in time, of magnitude or intensity, of cause and effect, etc Success (achievement) depends upon selective grasping of those relations that are *relevant to the attaining of the goal*[3] Speaking of Ruger's wire puzzle tests for human beings, Koffka[4] says substantially the same

In addition to the mere perfection of manual dexterity learning consists essentially in an *organization* of the whole procedure If a successful movement comes about by chance as a rule the first consequence is this that the region in which the work is being done, or the particular kind of movement that is being made, is now emphasized and becomes the focus of the whole procedure In a large number of cases the solution, therefore is almost entirely a matter of locus or place analysis , that is, the subject now

[1] *Mind in Evolution* p 130
[2] Op cit pp 346-347
[3] *Energies of Men* p 345
[4] *Growth of the Mind* p 195

knows where he has to work Thereafter a marked descent is recorded in the time-curve, without subsequent rise.' [1]

Thus all these observers have realized the existence of some primary *law of insight*, which is just that which Spearman formulates when he declares ' that the mentally presenting of any two or more characters (simple or complex) tends to evoke immediately a knowing of relation between them Clearly some word like *eduction* was needed to distinguish this noegenetic process from the merely associative' The term *perception* is misleading in this connexion as it already has a very definite meaning as the cognition of sensory experience, whereas eduction of relations is one and the same process whether it takes place upon the sensory or ideational level, that is, whether it operates between concrete or abstract fundaments

3 *Foresight or Eduction of Correlates*—Mere eduction of relations will not bring about a new and original adjustment, it can but give meaning and coherence to the situation Something further is required The Gestalt psychologists bring in the principle of *closure*

> In the achievement of Köhler's chimpanzees we find *new creations of a pure type* occurring, in these experiments, quite free from chance Instead of the solution first arising by chance and thereafter becoming more or less ' understood,' *understanding*, or an appropriate transformation of the field, *precedes the objective solution* When a solution is found the situation is altered for the animal in such a way that *a gap in the situation is closed*, that is to say, the desired but unattainable fruit has come within reach We have here the characteristics of closure '[2]

McDougall uses the word *foresight* for this anticipatory element

> We ourselves commonly achieve insight and solve a problem only when we are trying to solve it, when we have set the solution of the problem as our goal, when we have the goal in view, or have *foresight of the goal*' [3] The

[1] Cf Köhler's analysis in *Mentality of Apes* pp 218 219
[2] *Growth of the Mind* p 224 Italics are the writer's.
[3] *Energies of Men* p 347

solution is the goal towards which we look forward, and such looking forward, such desireful foresight of the goal and of the attainment of it, governs or guides or steers the selective activity which picks out the relevant relations." [1]

Both these descriptions would seem to be satisfied by the principle of *eduction of correlates* whereby, "The presenting of any character together with any relation tends to evoke immediately a knowing of the correlative character Naturally the Law of Conation must operate to hold the relevant character and relation before the mind, to concentrate mental energy upon it, or in other words to secure it attention, as McDougall notes Moreover, the whole process will be shot through with that of reproduction

The point will best be clarified by trying to apply these two principles, eduction of relations and of correlates, to the problems which have already been discussed

(*a*) *Thorndike's Cats*—They are confronted by two fundaments, viz confinement and the desired escape, their problem is to discover the movement relation between them, the first (and only possible) mode of solution is to reproduce in more or less random order every movement relation which has ever served them in the past, this is indeed *trial and-error* or *trial and success*, for one movement from the range is eventually successful and release comes Whether this can be applied again depends upon whether the *relation* between escape and relevant movement was cognized, as has been seen the first relation to dawn seems to be of a spatial order, somewhere there.' If it has been so educed, however dimly, it will be employed upon the subsequent occasion, thus fundament, the desire to escape from captivity situation → reproduced relation, about here,' → correlate eduction, the required movement Again it may be noted that the correlative movement may function as a reproduct of the previous muscular sequence, or it can be executed in any way which brings about ' pressure here,' or whatever it may be

(*b*) *Köhler's Description of the Stick jointing* [2]—Food is seen out of reach, and a perceptual relation educed of too great

[1] Op cit. p 348 [2] *Mentality of Apes* pp 130-131

distance' between fruit and cage, the ideational fundament of anticipation, "food here,' plus the relation 'nearer," must then as it were, go in search of the required *means*, the correlate to be educed Many past solutions are reproduced some perhaps ideationally, some in actual trial Thus Sultan, being used to reaching with single sticks, takes great pains to try to reach the fruit with one or other of the inadequate length sticks, even pushing his right shoulder through the bars', he even fetches a box used in other tests (a bad error"), but at once rejects it, the two sticks begin to be seen in some conjunctive or constitutive relation—he makes what Köhler calls a "good error he pushes one of the sticks out as far as it will go, then takes the second, and with it pokes the first one cautiously towards the objective until it actually touches the fruit and this is repeated several times in vain The required correlate has become 'poke with sticks joined, but a new problem has arisen, how are they to be joined, since mere juxtaposition does not hold them together? Then, as described the 'chance," solution of one fitting into the other arises from his relevant but fumbling efforts to unite them At once he runs to carry out the correlative movement of poking with this lengthened stick and *although the sticks do not fit well and drop apart* several times before the fruit is reached, he has no hesitation in rejoining them more firmly by the socket method

(c) *McDougall's Tank Rat*—The pause and hesitancy seem to coincide with the first dawn of the relation which has to be educed between "bright light (a percept) and 'pain of electric shock" (a reproduct), this after a few times rises to clearness Now comes the eduction of a correlate, from the fundament "desired painless escape," and the relation away from light the correlative movement 'swim towards D, or 'away from B is educed, and having once come to clearness it is invariably executed irrespective of previous more or less equally distributed practice effects

Two further points remain to be noted[1] (i) Throughout the execution of the correlative movement relations must successively be educed to check its correctness, clumsy reaction even along the right lines may be of little avail Thus the ape

[1] Cf *Nature of Intelligence* Spearman pp 59-260

watches carefully that his movement solution is fetching in the fruit, adjusts to unevenness of ground and general refractoriness of matter, and even the rat would seem, if one may put it so, "to keep his eye on the ball," for if at the last moment the light is switched over, he reverses his direction The rat going back to review the fourteen latches exemplifies the same (ii) The notion of the correlative movement so educed must be united by a constitutive relation to the notion of carrying it out by means of conation, in order for it to be put into practical operation, otherwise the solution might merely be contemplated, instead of being translated into activity

Enough should now have been said to show that all these performances, whether so-called solutions of trial and-error or of insight, are shot through and through with eductive operations, and are amenable to analysis upon the principles of noegenesis, however much they may or may not wear the outward dress of sensori motor reproducts

4 *The Law of Pleasant or Unpleasant Feeling and the Law of Effect*—Thorndike has recently re affirmed his Law of Effect as the fundamental law of learning[1] Hobhouse early raised the objection that the confirmatory wave' must be conceived as gradually spreading, as it were, backward McDougall echoes this, How can the pleasure, which does not arise until the crucial movement has ceased and been followed by many other movements, how can it stamp in the association between that movement and the sense impressions that evoked it? Causes must precede their effects [2]

His own account of the role of pleasure and pain, and of the *complex feelings*" which derive from the cognition of the success or failure of the conation at work, has already been given in Chapter VIII Apart from any different conceptions of the *quality* of the feeling the contrast between McDougall s and Thorndike s views is stressed in the following passage All through the process of learning at every crucial point, pleasant or unpleasant feeling plays an essential rôle feeling which accompanies and qualifies the activity, not feeling which comes (as in Thorndike s

[1] *Fundamentals of Learning* 193 p -76
[2] *Mind in Evolution* p 98
Energies of Men p 353 and other works

interpretation) only on completion of the task, but pleasant feeling which comes before attainment, evoked by anticipation of success, and unpleasant feeling which also comes before effort is completely blocked, comes with the anticipation of such blocking '[1] The attribution of such humanly introspectible feeling to animals he considers to be strongly supported by the experimental evidence of Professor Washburn that in learning to reach food in the centre of a maze, rats do in fact learn first the turnings of the maze nearest to the food box, and the rest in inverse order, so that the initial turnings are the last to be mastered

So far, then adjusted achievement has been shown to depend upon the desire to achieve, 'intelligent' insight or eduction, and the pleasant feelings which accompany successful striving (with their converse), factors intimately known in practice to every teacher who tries to provide and cultivate the right incentives, *to develop understanding rather than parrot learning*, and to give play to the pleasures and pains inherent in all keenly undertaken enterprise

It still remains to examine the true rôle and function of

5 *The Law of Retentivity and the Process of Reproduction*, variously named the Law of Frequency, Use or Exercise, whereby 'the occurrence of any cognitive event produces a tendency for it to occur afterwards' This is analysable into the *Law of Facilitation*, whereby 'cognitive events by occurring establish dispositions which facilitate their recurrence', and the *Law of Association* whereby cognitive events by accompanying each other establish dispositions to do so thereafter'

That the types of adaptive learning which have been examined cannot *merely* be explained by *facilitation through repetition after a chance solution*—which has been known as *trial and error* learning—has been already demonstrated It is disproved on one hand by the discovery of alternative explanations based on insight, and on the other by Thorndike's observation that in fact the right reaction is not usually the one most often practised in the learning and by the wealth of testimony, endorsed by Hobhouse,[2] Koffka,[3] Köhler[4] and McDougall,[5] that the solution

[1] Op cit. p 357

[2] *Mind in Evolution* p 199

[3] *Growth of the Mind* p 177

[4] *Mentality of Apes* p 225

[5] *Outline* p 197, and elsewhere

is often achieved by means of very different motor adjustments for its execution (e g the alternative uses of paw, snout, scratching, biting, pushing, pulling, etc.)

The question arises, whether there is any type of learning which results from mere quasi mechanical repetition It has already been noted [1] that Spearman finds no correlation between retentivity and *g* It has further been observed that the mentally defective can often be taught considerable facility along some lines in operations where they can be ' shown how ' or merely trained by repetition Spearman quotes an interesting experiment by Woodrow

' He worked with 42 normal children averaging 9 years and 37 ' defective ' ones averaging 14 years, the two groups having been carefully selected as making equal scores with the Binet-Stanford tests Both were then tested further in various ways sorting five lengths of sticks, sorting coloured pegs, cancelling letters, cancelling geometrical forms, and sorting wads In all these, be it noted, there is little room for advantageous change in mode of operation, so that any improvement made by practice must be credited to retentivity Next, both groups of children were practised for eight minutes on 13 days at sorting wads The question then was as to whether or not the effect of practice would improve the normal children more than the defective Actually, the two groups improved to just about the same extent. ' [2]

Thus it would appear that there is a second type of non-intelligent learning dependent upon mere repetition of some particular sequence of activity Situations and activities which preclude insight will force this type upon the intelligent, and it must be noted that some of the test situations force it upon their animal subjects who are not given opportunities for insightful examination of the whole lay-out of the field Animals increasingly down the scale of life will tend towards the use of this method, and human beings of lesser intelligence are more likely to make a compensatory use of it than others

Education must wherever possible call for noegenetic insight in the initial achievement, although this may afterwards be

[1] Ch IX p 172

[2] *Abilities of Man* pp 284 285 from *Jour Educ Psych* 1917, VIII

benefited by facilitation through practice But the advantage of the latter is by no means general Thus Köhler describes the 'bad errors' of his apes as

> the *after-effects* of former genuine solutions which were often repeated, and so developed a tendency to appear *secondarily* in later experiments, without much consideration for the special situation The preceding conditions for such mistakes seem to be drowsiness exhaustion, colds, or even excitement [1]

And even in the correct application, he notes that

> Processes originally very valuable, have a disagreeable tendency of sinking to a lower rank with constant repetition"
> 'I must say that I like the behaviour of the chimpanzees during their tenth or eleventh repetition of a solution less than that in the first or second [2]

In this way Köhler describes the process known as 'getting into a groove' a process which, however useful it may be for certain performances of daily routine would appear to have a deadening effect upon creative and æsthetic achievement, as well as upon independent mental activity such as Köhler was concerned with

The way in which the reproductive process may handicap practical adaptation is further brought out by Strasheim's experiment with human subjects, who were required to thread a series of mazes unlike in general appearance but built up upon a common principle with increasing complexity These were given to children of about equal standing at school but half of them were comparatively young and therefore bright whilst the other half contrariwise were old and dull' [3] With few exceptions the 'dull children are able to memorize the correct paths in the five principal mazes as quickly as the bright', but in the later mazes they continually come to grief, and their false move is always due to the influence of reproduction Here then retentivity and intelligence are found to [illegible] ance

That there is a useful place in life for r[illegible] [illegible] execution of routine performances which [illegible] in free for a further level [illegible] cannot be [illegible] even

[1] *Mentality of* [illegible]
[2] Op cit p [illegible] *Ibid* [illegible]
[3] Quoted op. cit [illegible]

be that the process of mechanization of such tasks is assisted by the use of intelligence Moreover, solutions originally requiring insight may often be rendered more available by practice repetition There is certainly a value and a necessity along some lines for habits which render action more rapid accurate efficient and integrated

To sum up thus far There would appear to be two types of learning intelligent learning dependent upon the eductive processes, and unintelligent learning dependent upon the reproductive processes, and based upon repetition The two forms are seldom wholly distinct and are found in actual life in all forms of intermixture It is doubtful whether man and the higher animals ever learn wholly by the trial and error method without some eduction, if only of spatial relations But something approximating to it may occur on lower levels of development, or in human beings of low grade intelligence, or with any subjects where the task is a blind one, the conditions of which allow little or no scope for insight

The term *trial-and error* may well serve as descriptive of the learning process if it be interpreted as operating, not merely to link *movem nts* by the blind physical formation of synaptic bonds but to test out eductive solutions whether on the concrete physical plane of movement, or on the abstract mental plane of thought Intelligent development seems to proceed largely by the fertility of the trial solutions which suggest themselves and the rapidity with which they can be examined, discarded or recognized as correct, on the mental or ideational level But of this more will be said in Chapter XV which deals with the more complex thought processes

With regard to *imitation* as a method of learning there is little or no evidence of mere aping in either human or animal learning It was pointed out in Chapter IV that this touching off' of natural reactions is confined to such simple responses as smiling or yawning Human beings, however, certainly learn from the perceptual observation of others, especially when attention is directed to a solution which they are seeking, and in this they are aided by language It would also appear that some animals can be 'shown how' to effect a solution if their attention can be secured to the relevant features of the performance

CHAPTER XIII

THE LEARNING PROCESS (II)

FACILITATION TRANSFER OF TRAINING FATIGUE

FACILITATION OR THE ACQUISITION OF SKILL BY PRACTICE

THE greatest single law governing the acquisition of skill, either mental or bodily, is generally considered to be the law of facilitation based upon repetition Yet the factors which govern the mode and distribution of repetitions are so complicated that it is far from being a simple case of "the more the better," as experimental investigators are constantly demonstrating The conditions of improvement in motor skills of all kinds have not unnaturally received more attention in the industrial than in the educational field, the results, however, have their bearing upon the many manual occupations of the school, from learning to write, to learning to carpenter, sew, cook, typewrite, as well as upon the technique of the arts, and upon sports training Some of them are applicable to the learning of ideational material, but, on the whole, memory for ideational learning has formed a separate and more academic topic of study, with its own not very disparate conclusions

The Learning Curve—Typewriting has formed a popular subject for experimental treatment and the following curve, based upon practice by the touch method may be regarded as more or less typical for practice in motor or mental skills The student should compare with it the curve which he obtains for the continuous addition experiment,[1] as also that for mirror drawing,[2] both of which are likely to show some of the characteristics noted below

[1] Experiment 9 [2] Experiment 8

No two curves are ever the same, and yet it is possible to sum up certain general, or recurrent, features

(*a*) There is an improvement of work, as shown in increased speed or output manifested in the rise of the curve on the whole

(*b*) This does not follow a smooth curve, there are constant more or less slight oscillations in efficiency

(*c*) The variations in rate of improvement are not uniform throughout the practice period, even discounting the smaller fluctuations The rise is usually sharpest near the beginning of the curve, in spite sometimes of a drop immediately after

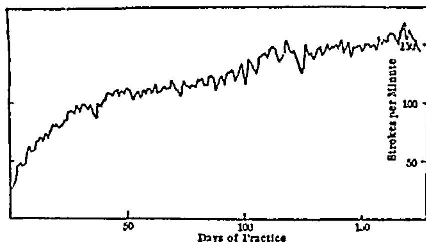


FIG 30—Typewriting by the touch method (*After Book*)

Each point on the curve represents a daily record in number of strokes per minute

starting It shows a period of incitement or 'warming up' to the task where it is the record of a continuous performance It tends to flatten out at the upper end as the physiological limit is approached although this tendency may yield to improvement of method There may be in each operation (with individual variations), a suitable length of training beyond which nothing will be gained by continuing it, but this period would have to be specifically determined for different occupations The curve suggests what Watson calls the 'law of diminishing returns', that is, the rate of progress as practice continues tends to diminish as efficiency increases Thus when

two subjects begin their practice at a different initial stage of efficiency the immediate improvement of the less skilled one tends to be more marked, both relatively and absolutely The practice effect is not necessarily less for an individual who reduces his time from 40 seconds to 30 seconds *than for* one who reduces it from 100 seconds to 80 seconds in the same occupation This is well understood in ordinary life The beginner in golf is soon expected to reduce his handicap, and a speedy drop from 36 to 18 holes would not single him out as a budding champion whereas the veteran with a 9-hole handicap, will think much of a reduction by one, and the "plus three" man may struggle for years to achieve "plus four"

(*d*) Most curves show (as the one above does towards the upper end) *plateaux* or flattened sections indicating absence of improvement in spite of continued practice Various explanations have been given by different investigators for such a period of arrested progress[1] (i) By some it is attributed to temporary failure in attention and effort on the part of the subject, to flagging or boredom in which case it should be capable of elimination with sufficient incentive, its danger will lie in stabilizing a lower level of achievement than that of which the subject is capable (ii) It is regarded by others as inherent in the learning process (iii) Again it may be due to unsatisfactory arrangement and distribution of the practice (iv) It is of further importance to know whether it indicates *a period during which new and higher co-ordinations are being* developed, in which case it might be possible to avoid or shorten plateaux by teaching wider habit units from the start A claim has been made that the plateau was eliminated in typewriting when words instead of letters were learnt from the outset[2]

Incentives—It follows from the Law of Conative Control already discussed that right incentives exercise a great influence upon progress Yet it was noted that very great effort can defeat its own object either by increasing speed at the expense of accuracy or by deflecting energy from the task in hand[3]

[1] Some investigators question the validity of these plateaux

[2] J W Barton "Comprehensive Units in Learning Typewriting" *Psych. Monog.* 35 (1926) No. 164 p 47 Quoted by Viteles in *Industrial Psychology* p 401

[3] See pp [illegible] above

In the experiment quoted below, Cox[1] found no correlation between the scores made at the tests and the apparent effort displayed by the subjects as estimated by two independent observers, moreover, subjects frequently attributed a bad score to trying too hard, and the boy who made the lowest scores throughout literally sweated at the work for the monetary reward offered Thorndike experimented with a language test, punishing' incorrect answers by electric shock and 'rewarding correct by money or by mere announcement a right response rewarded on the first trial caused an increase from 1 chance in 5 to 2 in 5 in correct responses, a punished incorrect first response produced no change in the chances of subsequent correctness Ross[3] divided 59 students into three parallel groups for a simple speed test in drawing lines one group was given full knowledge of its progress from day to day the second was given partial information and the third was given no information concerning progress All were urged to maximum performance The average gain for group 1 averaged 6 2 per cent in advance of group 2, and 8 per cent beyond group 3

Whatever is shown by the effects of *immediate* effort, which may not always be well directed to relevant features, there can be no question about the importance of the wider motivations which bring the subject to the task and sustain him in it

Training versus *Practice* —Attention is being directed to some important comparisons between the improvements achieved from systematic instruction and training, and those resulting from mere practice repetition

J Peterson[4] records a ring throwing experiment carried out by Goodenough and Brian with twenty 4½ year old children who were divided into three groups Group A were left entirely free in their method of throwing but were praised and encouraged Group B were given a brief preliminary demonstration

[1] Experiments on Training in Acquisition of Skill J W Cox *Brit Jour Psych* Vol XXIV Pt 1 July 1933 p 72

[2] Quoted *Industrial Psychology* Viteles p 405

[3] Op cit p 405

[4] *Handbook of Child Psychology* ed Murchison Ch X *Learning in Children* J Peterson

and instructions, and subsequent verbal criticisms and instructions, Group C, in addition to the preliminary training given to B were taught to follow a definite procedure and were forbidden to experiment with other methods The three groups had been divided as equally as possible as regards age and intelligence test scores, and were kept equal in the amount and distribution of their practice The curves show that when they were stopped on the fiftieth day, all three groups had markedly improved, Group C being considerably in front of the others, the percentage gains in the second half of the trials being 36, 56, and 92 respectively

J W Cox,[1] in the course of a wider research, applied both practice and training methods to two groups of subjects in one of a series of tests in assembling an electric lamp-holder During the eleven practice periods, one group merely practised without direction, and rehearsed the process 440 times The other was given special exercises on general method, "eye observation," "finger observation" (kinæsthetic), and concentration of attention, followed by some practice of the operation as a whole under normal conditions, these subjects had in all only 85 actual rehearsals of the process The "trained group were behind at first through lack of practice, but by the eighth day they had, after 40 repetitions, caught up the practisers, who had completed 300

The curve[2] shown is suggestive of the superior claims of insightful learning

In view of some present-day methods of leaving children to do things in their own way, without any technical instruction (as for instance in drawing and handwork), results such as these may be worth pondering

Whole versus *Part Learning* —This question which has loomed so large in verbal memory experiments has more recently been considered in relation to sensori motor learning Results, as might be expected, are somewhat conflicting It would appear that the *whole* method is the most satisfactory for simple tasks but that some analysis is advantageous for more complex tasks, though the sub-divisions should be kept as large as possible

[1] *Brit Jnr Psych* Vol XXIV Pt 1 July 1933 pp 76 ff
[2] Op cit p 84 *Manual Skill* J W Cox p 174

It seems a good rule to *begin* with "both hands together" when the task requires them

Length and Distribution of the Periods of Work—This question will be considered here from the point of view of practice value, and the study of the optimal rest pause and length of session will

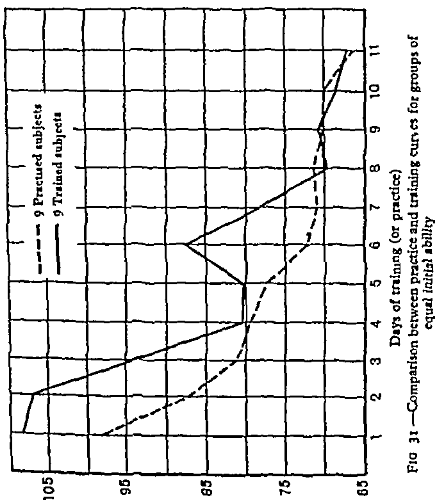


FIG 31—Comparison between practice and training curves for groups of equal initial ability

be discussed under the subject of fatigue Much investigation has been undertaken both with sensori motor and with verbal material, the former will be briefly reviewed here, the latter in the next chapter

The findings have in general been in favour of short, distributed

periods rather than of long, accumulated practices, but it is dangerous to generalize from one subject to another Greater frequency of the periods probably helps by more repetitions of the perseverative after-effects which consolidate the neural and muscular modifications The results have generally been considered to be superior in durability The classic experiment was that carried out by Starch with a test which consisted in substituting numbers for letters according to a key [1]

> Ten minutes twice a day was productive of the greatest progress, twenty minutes once a day was productive of almost as rapid progress, forty minutes once a day was productive of considerably less progress, while 120 minutes at one time produced scarcely half as much progress as the ten minute or twenty minute periods The total time in all four distributions was the same

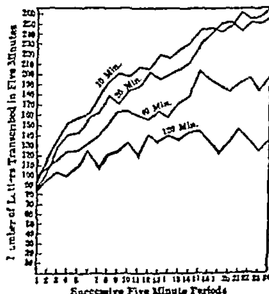


FIG 3.—Improvement in a substitution test with four different practice periods (Starch)

"Little and often" would therefore seem to be the most economical rule but many specific influences are involved Results depend partly upon how the intervening times are spent

[1] *Educational Psychology*, Starch p 154.

Speed versus *Accuracy*—It is important to know whether it is better to concentrate upon accuracy or upon speed first in teaching a new skill The following experiment in typewriting is instructive [1] Two groups of 7 girls practised 3 minutes for 36 consecutive days, one being exhorted to speed the other to accuracy, at the end of the time the accuracy group showed little gain over the speed group After 4 months without practice by either group, each was given unfamiliar material to practise for 10 minutes The speed group averaged 383 words with 2 2 errors per 100 words, whereas the accuracy group averaged 151 words with 1 2 errors per 100 words Nevertheless other experimental results indicate that ' speeding is best begun from the beginning in *simple* tasks, and in any case should not be delayed too long, because different co-ordinations may take place for slow movements, and these will be a hindrance later The conclusion seems to be that in training it is best to emphasize *correctness first*, but to introduce the *speed factor as soon as possible* so that the formation of bad habits may be avoided

The Best Methods of Work—As is implied in the foregoing discussions, it is very important that the beginner should be put into the best methods of work and the right movements from the beginning, and not left to fumble upon a more or less inefficient method which will never bring him to the maximum of which he would have been capable, practice may fix the bad movements as well as the good This is becoming increasingly understood in the teaching of music, for instance, and no beginner is encouraged to strum in his own way between lessons It was thought at one time that by a study of motion pictures, the analysis of their best features and the synthesis of them into the *one best method of work*, a perfect technique could be demonstrated and taught in any given operation But such a composite movement is not necessarily the most natural nor need it be the best for every one, for individual differences cannot be overlooked All improved methods must aim at the ease, satisfaction and freedom from fatigue of the subject even before increase of output, though actually the former is probably never secured without the latter following as a consequence Both

[1] *Industrial Psychology* Viteles p 4 9
[2] Cf *Motion Study* F B Gilbreth 1911

psychological and physiological factors call for consideration. The movements should be so arranged as to follow on by easy integration into a smooth pattern which can be attended to as a whole. Angular jerky movements should be avoided, as also any sequence in which the *lag* or *inertia* from one movement interferes with the efficiency of the next by *perseveration*. Probably one of the most important considerations involved is that of right *rhythm*, which is assisted by the elimination of useless movements. Myers[1] considers that to enforce speed is apt to produce flurry, overpressure and needless movements, but when the initial stress is laid on ease of movement, and style is secured, then speed will take care of itself. He distinguishes three classes of movements, necessary movements, those due to the worker's adaptation to rhythm of movement, and those due to inexperience and bad arrangement of material. While the last must be abolished, movements of the second class need careful study, they may be merely fatiguing and useless, or they may be an integral part of the worker's style.

Once more, this scientific invasion into movement technique is not without pedagogical significance. A few decades ago when elementary teaching was largely a matter of standardized collective instruction, there was a vogue for '*drills*' of all sorts and kinds—thumble-drills, knitting-drills, needle-drills, pencil drills, pen wiper-drills, breathing-drills, vowel-drills and what not, the formal drill often preceded any actual performance of a task. Probably the children, unless contra-suggestible or very individual,' derived a certain pleasure from the slickness of it all, and the teacher was saved from the impossible situation of unwieldy numbers and could feel all were mastering something. With the rise of self-expression methods this came to be considered as arbitrary, unnatural and frustrating. No one could furnish scientific proof that the steps analysed in the drills were actually the best and most effectual, the observer was often conscious that not all children in a class were at a stage where the drills were equally appropriate, and some seemed actually hindered by regression to component steps of a movement. Nevertheless it has been doubted whether the more "do-as you will" methods

[1] *Industrial Psychology in Great Britain* C. S. Myers pp 83 and 79

have produced the same neatness an
fundamental skills, such as handwr
with freer methods, a far greater p
school to the acquisition of crafts, an
have more than a foot over the thres
such activities that the ill-effects o
methods are most concretely appare
and in the wastage of *plant* which in
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Some new synthesis needs to be
are signs that the realization will lead
"discipline" The children themse
the scientific standpoint of objectiv
and welcome the training which it
objective measurement of results ar
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accepted criterion It is likely too t
will be largely objectified, so that s
speed and technique will be mediat
and the gramophone, and the subje
drill seem an imposition by the teac
stead the teacher will be swept along
pupils to attain, and they will look to
and they too will have their clues t
the teacher will not simply be the ex
craft must still be teaching Myers
is generally a good demonstrator bu
own movements are so rapid and aut
and explain them

Two illustrations of this scientific
mind First, there is the pupil in c
shorthand speed, as it were, hung
appraise, his first introduction to t

Secondly, the change is reflected in the progressively scientific methods of the physical training schools. Games-coaching is not merely strenuous, but a fine art; to play through a trial game is no longer a suitable practice for a hockey team; and trainees will submit to the exactions of the eager, impersonal coach as willingly as they have ever submitted to previous training disciplines in the pursuit of prowess and victory. The young respond once more to the call of hardness, even when the mental demand for skill and strategy is almost as great as the physical demand for sinew.

Will the wheel turn once more, so that an ' ever new education ' will presently search among a mechanized pedagogy for the residuum of the ' culture ' or the " leisure " of its old slogans? Or is the perfect harmony already in sight?

TRANSFER OF TRAINING

It was a logical outcome of Faculty Psychology[1] to suppose that the exercise of any faculty in any operation would improve its efficiency in every other sphere in which it happened to be involved, so that Memory could be improved by memorizing, Reason by mathematical reasoning, and so on. The curriculum was thus built up upon a *formal discipline* which enjoined this or that subject for the particular mental exercise which it afforded. Latin and Greek were considered to be the subjects of paramount disciplinary value; actually the best boys excelled in them because they were the best, not necessarily because classical study had made them so; for, as has been noted, it is peculiarly saturated with *g*, not even the specific articulatory factors of a modern language being required. James was one of the first to query the validity of formal training and the early investigations led to a somewhat violent contrary reaction. It is now known that the issue is an exceedingly complicated one, and that no general dictum can cover all the facts.

The problem lies in how far the training in one mental operation improves other mental operations. Several factors are thought to be of importance.

[1] See Appendix I.

(*a*) The extent to which the operations concerned overlap one another in psychological (not merely superficial) components In other words are there any *common elements* or *group factors* ? It has already been shown that group and broad factors, so far as they have been disentangled, are connected with particular relations (spatial evidential psychological and conjunctive), so that the explanation of transference on these grounds would rest upon *common relations* in the two tasks Overlap may be large or small, or one function may be a constituent part of the other It is also suggested that transference may take place from a complex to a simple operation but not conversely

(*b*) More importance has been attached by others to the *method of training used* Where abstraction and generalization take place and the greatest common element is thus made explicit and conscious it is thought to have a much wider 'carry-over' This would lay the emphasis upon the *method* rather than upon the *matter* of education

(*c*) Attention has recently been paid to the *way in which transference is effected*, whether it improves the initial ability in the second task, or whether it increases the subsequent improvement in it, a point which might turn out to be of even greater value than the initial advantage

(*d*) *Negative transfer* is sometimes shown between operations which may even be outwardly similar, that is to say, practice in one interferes with and hinders performance in another following upon it This happens when a habit formed in the first operation is antagonistic to one required in the second, or when a disadvantageous inertia from the first persists into the second In the latter case it may be worth while to continue the second operation until this wears off, to see whether improvability will show itself later

Experiments on transfer of training usually follow the method of parallel or equivalent groups [1]

The procedure is to give all the subjects a short initial test (not long enough to have too much practice-effect), and on the strength of it to divide them into two equal groups, one of which is kept as a *control* group, while the other practises some

[1] See Ch. XVI

so that the common elements and the bearing of one subject upon another become more apparent. It is possible in schools for two language grammars to be kept in water-tight compartments, or even two subjects such as arithmetic and algebra, perhaps because they are taught by different teachers or in a stilted fashion their common elements are never drawn together in the pupil's mind. (3) This idea has been developed by Judd[1] in a theory of the *Generalization of experience* which suggests the importance of sound language habits for the formulation and abstraction of knowledge for wider application and of a study of scientific methods to encourage orderly and integrated modes of thinking. (4) Finally, it is well to remember that the habit of relevantly directed mental energy or concentration on the matter in hand, and the power so to control attention at will, probably form together *the most generalized single habit and the one which most repays cultivation* for its wide spread through all departments of life.

FATIGUE

Fatigue is another subject which has probably received more experimental attention in industry than in education, partly no doubt because it is easier to estimate changes in output in manual occupations, specially where they are of stereotyped pattern, than it is in varied mental operations; partly because of the direct economic importance for the employer; partly because of the impetus given to the subject during the war when Governments were keenly concerned in munition output; and largely, in Great Britain, through the consequent creation of the Industrial Fatigue (now Health) Research Board, and the later formation of the National Institute of Industrial Psychology. In many respects, however, educational psychology can adapt for its own use the results of the researches, especially in regard to the teaching of manual and physical subjects. Nevertheless the school situation differs widely from the factory in objective and in psychological conditions, so that much of the "pure" knowledge of the mental and physical factors upon which fatigue depends must be taken up and worked over afresh under school conditions in order to achieve a valid pedagogical application.

[1] *Psychology of Secondary Education*, 1927, C. H. Judd.

By the *Law of Fatigue* the occurrence of any cognitive event produces a tendency opposed to its occurring afterwards. This is the very reverse of the Law of Facilitation. It means that throughout all a person's mental (and, for that matter, physical) operations these two tendencies, to repeat and to block, are working in opposition.

The concept of fatigue embraces three factors:

1. A *feeling* of fatigue or tiredness.
2. A *physiological* state due to chemical changes which influence the nervous system.
3. An *objective* manifestation shown in impaired efficiency and measurable by a reduction in output of work.

The Feeling of Fatigue

Under this heading two different phenomena present themselves: (*a*) The *sensation of weariness* which comes with prolonged work, the subjective indication of actual physiological changes producing decreased capacity for work. (*b*) *Subjective fatigue* which represents a loss of efficiency from tired feelings which may be dispelled by interest or mastered by will. In actual life the feelings from these two sources are inextricably mixed and often resist introspective analysis, whatever inferences regarding them the subject may be led to make by experience.

The sensations of weariness consist largely of localized bodily sensations of fatigue, especially those which arise from heaviness of the eye lids. There is sometimes hyper-sensitivity of the sense organs, such as exaggerated reaction to noise or visual hallucination; sometimes a depression of sensitivity, as in dulled hearing. At one time the change in the threshold of cutaneous discrimination of two points of an instrument known as an æsthesiometer was regarded as the best index of fatigue. Though fatigue does indeed affect the threshold, it does so under conditions so complex that the method and the results compiled upon it have been invalidated. Further, there may be loss of self-control, emotional excitability, failure to inhibit worrying emotions, or a state of light headedness which may be accompanied by a sense of exaltation inspiring to increased work activity.

from the intestines which absorb it from the food in the process of digestion The activity of the muscle converts this sugar into *lactic acid*, a toxic substance, which can, however, be reconverted into glycogen by oxidation, for this it is dependent upon the *oxygen* brought by the blood from the lungs, should the activity be too violent or prolonged to allow oxidation to take place fast enough, the lactic acid is carried away by the blood and affects muscles and nerves in other parts of the body, so that what began as *local* fatigue may become *general* Mean while breathlessness indicates the shortage of oxygen Experiments upon animals, in which circulation has been cut off from one leg, show a more rapid incidence of fatigue without the blood supply Another factor in fatigue is the formation of *carbon dioxide* which takes place in the conversion of lactic acid back into glycogen That these two products have a toxic effect is evidenced by further animal experiments, whereby an electrically stimulated excised muscle which has become resistant can be restored to activity when it is flushed with salt and water for the removal of these products, and the injection of blood from a tired animal into a fresh one can produce fatigue effects in the latter It is doubtful, however, whether the muscle itself would ever become totally exhausted by normal exercise.

It is the reciprocal action of the nerves upon the muscles which appears to be eventually responsible for the inhibition The waste products in the blood also affect the nerves, and, together with the fatigue products from the nerves themselves, serve to clog the neural workings, more particularly at two points First, it is thought that the end plates of the motor axones which operate the muscles in question are affected and so lose their power of innervation Secondly, and this is thought by some to be the most significant physical factor in fatigue, the synaptic junctions may become clogged so that their resistance is raised and nerve impulses are unable to traverse them, and are inhibited or switched into other directions

Such an explanation would account for the supposed generation of *mental* fatigue from *muscular* fatigue It would also account for the recuperative value of a change from difficult work to easier processes which can be automatically performed by the

lower nerve-centres while the higher rest, and for the less fatiguing nature of automatic work in general

Modern investigations in biochemistry are indicating other results of fatigue upon respiration, blood pressure, blood-cells, alimentation and glandular secretion The synthetic interaction of the body processes may prove an even more fruitful study than the analytic treatments of the past Not without interest is the hint which is thrown out of the possible existence of an anti toxin to fatigue which would counteract the poisonous effects, this would presumably be generated in the course of the activity itself, so that sustained effort would bring its own reward of fatigue immunity If this were so, it would explain the relative exemption of some highly self-disciplined workers from the rest requirements of others

The physical *remedies* and *preventions* of fatigue thus become plain Sufficient food with body-building properties goes without saying, the importance of sugar, especially for muscular workers, has been more fully recognized of recent years

Sleep is nature's best remedy, for it is in sleep that the body is most perfectly at rest, the synaptic resistances are then most impervious, so that the higher nerve-centres in particular are put out of action, and the muscle tone most fully relaxed Not all sleep is equally relaxing and refreshing, tone and energy manifestations are never altogether lacking, and anxiety or strain may keep the organism unduly alert. Children require more sleep than adults because it is in sleep that anabolism, or the building up of tissue, is best effected, and time must be allowed for the greater activity of this process which growth requires Women are generally considered to require rather more sleep than men There are, however, great individual differences in the amount of sleep required for recuperation, whether these are constitutional, incidental, or the result of habituation No correlation is observed between the amount of sleep taken and the amount of work done

Rest is one of the subjects of greatest importance in the study of industrial fatigue, which has largely been concerned with the search for the optimal or most favourable pause How greatly such a discovery would help teachers is seen in the constant discussions about time-tables, breaks and sessions which

characterize their gatherings The subject will be reverted to when experimental results are discussed

Ventilation—It used to be thought that good ventilation turned upon the elimination of carbon dioxide and an adequate supply of oxygen, it has now been discovered that even in bad ventilation these two factors are never found significantly in excess or defect This is well illustrated by an experiment[1] in which individuals kept in air tight chambers showed the usual symptoms arising from bad ventilation, even when supplied through tubes with fresh air for breathing

The essentials of ventilation are found to depend upon the *temperature* and *humidity* of the air and upon *air movement* The humidity of the tropics is usually found peculiarly trying by those unaccustomed to it, and a lower temperature of moist air is found to be more relaxing and detrimental to efficiency than dry air of a higher temperature But even if temperature and humidity cannot be remedied, the same air kept in motion through fans or cross-draughts will be found to have more beneficial effects than when stagnant Heat and moisture are given off from the body, and warm and saturate the cloak of surrounding air, but if this can be kept moving the excess moisture from skin and lungs is removed A current of cool dry air cools the skin stimulates the nerve-endings, and drives the blood from the surface to the viscera, deepens the breathing and increases the circulation By these agencies there is a prevention of discomfort and of the distractions arising from it No less important is the effect of good ventilation upon the prevention of disease, colds, and the major and minor ailments which reduce efficiency and promote irregular attendance

Illumination—Eye-strain is probably an important factor in the fatigue caused by mental work, it at once produces uncomfortable sensations of fatigue which may or may not have their correlates in other brain centres, but are likely to infect them if maintained Good lighting furthers and improves the sense of well being and brings about a better adjustment to the task, figures from industry show increased output as a result of improved lighting arrangements Intensity is not the only factor to be

[1] Quoted *Industrial Psychology* Viteles p 493.

considered, evenness of illumination and of surface brightness and proper diffusion to prevent contrasting shadows are also important

OBJECTIVE FATIGUE

As has already been seen, objective fatigue falls under the two classes of *local* and *general* fatigue, but these cannot be kept separate, as local fatigue, if continued, passes into general fatigue Nevertheless the distinction has a value fatigue is described as *general* when its onset diminishes the efficiency of the organism for any and every operation, and as *local* when it seems to affect only the particular nerve-centres and muscles involved The latter can be adequately dealt with by change of occupation the former only by rest

Objective fatigue has been subjected to experimentation in various forms

(*a*) *Tests of sensory acuity and muscular energy* were the earliest to attract attention, and it was hoped by them to get a measure of mental fatigue also Some of their educational applications were especially designed to discover the relative fatigability of school subjects The æsthesiometric tests have already been mentioned Tests of sensibility to pain, and of visual and auditory acuity were also used, as was the reaction time experiment in this connexion Favourite muscular tests have been the dynamometer test (a try-your-grip ' test) tapping or dotting tests, and ergograph tests The last of these requires the subject to pull a weight generally with one finger while the other muscles are restricted, and the length and number of the pulls is recorded automatically upon the smoked surface of a revolving drum an example of such tracings or *ergograms* is shown in connexion with the discussion on rest pauses The method has given useful information about muscular fatigue, but it is unsuitable for the measurement of mental fatigue

(*b*) Later developments in the testing of mental fatigue have employed mental material Kraepelin introduced the use of his famous reckoning sheet for tests in simple arithmetical processes, such as addition and multiplication Cancellation tests, for example of a certain number of given letters from a printed page, are also commonly used

Methods of testing can be classified also according to whether the tests are *interpolated*, that is, given as brief exercises before and after a work session, or at stated points within it, or whether they are *continuous*, that is, given to test the fluctuations of efficiency over a long period of more or less monotonous work of even difficulty

All present-day investigations lead to the common conclusion that fatigue is a much more complicated phenomenon than was commonly supposed and cannot be assessed by any rule-of thumb method, or by any single known measure Thus Myers writes

> " If we continue to use the term ' fatigue ' in industrial conditions let us remember how complex is its character, how ignorant we are of its full nature, and how impossible it is in the intact organism to distinguish lower from higher fatigue and fatigue from inhibition, to separate the fatigue of explosive acts ' from the fatigue of maintaining attitudes, or to eliminate the effects of varying interest, of excitement, suggestion and the like In industrial psychology, *our hope lies rather in the study not of interpolated fatigue tests but of the curves of actual output* [1]

In other words, the test, to be of value, must be specific to the task, unless the conditions and degree of transfer between test and process are intimately known

Spearman [2] has drawn attention to some remarkable indications in the cognitive sphere arising from an investigation by Phillips in which he tested the fatigue effects of continuous work in a number of different operations (multiplication memorizing, cancellation, physical drill) upon these same and other operations The results suggest

> that the person who is most easily fatigable for multiplication by one kind of work is so also for multiplication (but not for other operations) by further kinds of work Similarly as regards fatigability for cancellation, etc Thus, although fatigue (objective) has above proved not to affect any individual in special degree for his operations all round,

[1] *Industrial Psychology in Great Britain* Myers p 72 (italics are the writer s)

[2] *The Abilities of Man* p 315

it now does show itself to affect him specially for certain particular operations (these being always the same, whatever may have been the operation by which the fatigue was produced) In other words, he has for these particular operations a chronic liability to fatigue "

Hasty generalizations are therefore entirely ruled out if these highly specialized transfer effects actually exist, and detailed correlative studies must precede educational applications Spearman throws out the physiological hypothesis that the toxins carried by the blood [1] ' act selectively, so as to attack some systems of neurones with some persons but others with others '

The aggregate of experimental findings useful to education, which may provisionally be accepted, affect mainly the rhythm and incidence of fatigue during a work spell, a day, or a week, the best length of working hours the most favourable rest pause, and the surprising resistance of the organism to mental fatigue.

These will be briefly considered in order

The fatigue curve represents the composite result of facilitation by practice and of loss of efficiency by fatigue Both factors are present from the start, but in the earlier stages the former is in the ascendancy, and in the later stages the latter wins Opinions vary considerably about the exact course followed Spearman quotes investigations which indicate that

> a person's efficiency at any continuous work diminishes very rapidly for a period of about two minutes, but then undergoes very little diminution for hours, but finally there is an abrupt drop down to entire impotence But during all the time that so little diminution is manifested, a longer and longer rest becomes necessary in order to regain the full efficiency of the beginning, fatigue was really occurring all the time, but in such wise as to remain latent " [2]

The daily work curve is generally said to show an initial period of *incitement* or ' warming up ' which seems to consist in taking up an attitude towards the work and getting the attention absorbed in it to the exclusion of distractions This is accompanied by a period of *settlement* when the person adjusts and settles

[1] Op cit, p 318 [2] Op cit, p 309

down to work, these two factors unite with practice to give a rapid initial rise to the curve, which is succeeded by a period of maximum production After this the curve tends to decline, except for the influence of the lunch hour which raises it temporarily, and of *spurts* which seem to arise either from subjective or objective factors, and are noticeable sometimes as *initial spurts*, due to the first freshness, sometimes as *end spurts*, due to the anticipation of cessation The following figure is put forward as typical of the daily rhythm [1]

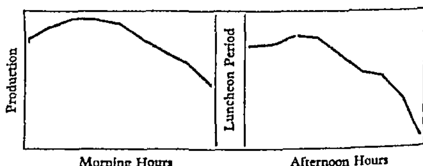


FIG 34—Typical Daily Production Curve (*After Burtt*)

It must not be interpreted too seriously as it is found to differ somewhat for occupations and individuals

Thorndike and other investigators have found very little decrease in efficiency throughout the school day, but results differ, and it is possible that the change and stimulation of the test itself do something to modify results It may be that efficiency is not so much objectively impaired by the end of the afternoon as influenced by the subjective factor of boredom, which suggests the usual practice of putting a popular and perhaps easier lesson at the end of the school day The second period of the morning, when incitement has set in and fatigue effects are still only latent, is generally considered the best and given to arithmetic, the passing subject Efficiency probably rises again after the *morning break.* Fox [2] *maintains that more attention* should be paid to the variability of the scores, or output, within short time units of a continuous task, and that mental fatigue manifests

[1] *Industrial Psychology* Viteles p 447
[2] *Educational Psychology* p 352

itself not so much in decreased output as in increase of the standard deviation,[1] due to the greater and uncontrollable fluctuations of attention

The weekly rhythm as measured by production results is described by Viteles [2] as showing lower production on Monday from loss of skill at the week-end, rising through *incitement* and *settlement* on Monday and Tuesday, to the highest production point on Wednesday, and thereafter declining in output, except *in some cases for an end spurt on Saturday, with the prospect* of the week-end rest overcoming fatigue

The best length of the working days and of the component shifts has been more open to quantitative evaluation in industry than in education Myers [3] quotes a war time investigation which showed a weekly increase of 19 per cent in output for munition workers following the reduction of hours actually worked from 58 2 to 50 4 per week He cites some evidence in favour of a forty hour working week suggesting that the hourly rate of output decreases, not only when the hours are more but also when the hours are less As regards length of shifts it was found in several tin plate works that the hourly output during four hour shifts was 11 5 per cent greater than that during eight hour shifts

These facts can but serve to warn the educator that length of time is not everything, but rather the degree of concentration which is made possible within that time Two scholastic investigations may also be quoted In a school in a London slum area,[4] the inspector complained of the girls backwardness in arithmetic The experiment was made of dividing certain classes into two groups equal in intelligence arithmetical attainment and physical condition and giving one group extra coaching in arithmetic, and allowing the other at the same periods to sleep in deck-chairs At the end of the time both groups were found to have made appreciable progress in arithmetic, but the group which had slept had improved far more than the one that had been specially coached

[1] See p 335 [2] *Industrial Psychology* p 448
[3] *Industrial Psychology in Great Britain* pp 59 and 60
[4] Quoted *The Subnormal Mind* Burt p 13

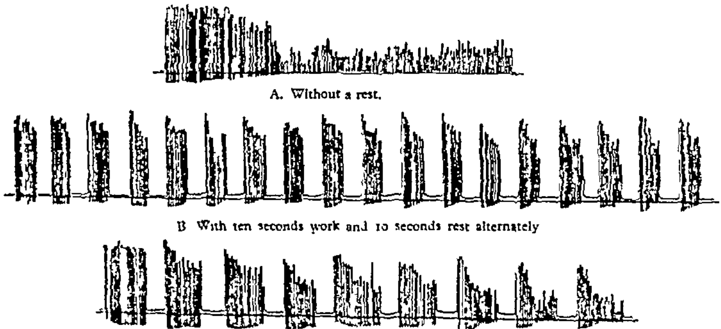
Starch[1] records an investigation made by G M Rice in the comparison of arithmetic results of 6000 pupils in eighteen different schools with varying lengths of time spent on the subject The amount of time given to arithmetic in the school with the lowest average (25 per cent) was practically the same as that in the school which obtained the highest average (80 per cent) Three schools scoring 36 per cent. gave respectively 30, 48, and 75 minutes daily to the subject, three scoring 64 per cent, 67 per cent, and 69 per cent. gave respectively 45, 45, and 25 minutes Many other factors besides fatigue were doubtless involved, but the results may give food for thought to teachers who can find no time for a wider curriculum for their pupils

Rest-pauses have received much attention but have proved themselves to be too complicated a subject for ready generalization *They need to be specifically determined* for each occupation, and possibly for each individual, and the best method of resting provides another problem The optimal pause should balance the production and elimination of the fatigue effects as exactly as possible, and so maintain freshness with a steady work output The accompanying illustration of ergograms represents this desideratum in a striking manner The weight was pulled (i) continuously for 180 seconds without a pause, (ii) with alternations of 10 seconds work and 10 seconds rest, (iii) with alternations of 20 seconds work and 10 seconds rest The total pulls, measured in millimetres, are as follows

	Total work in millimetres
(1) 180 secs work without rest	1271
(2) 180 secs work with 10 secs work, 10 secs rest	3625
(3) 180 secs work with 20 secs work 10 secs rest	1963

Thus the subject did nearly three times as much work and incurred less terminal fatigue when resting for alternate intervals of equal length with work periods, and actually did more work when working for only 90 out of 180 seconds than when working full time The 20 seconds work period with 10 seconds rest

[1] *Educational Psychology* Starch pp 391 394



A. Without a rest.

B. With ten seconds work and 10 seconds rest alternately

C. With 20 seconds work and 10 seconds rest alternately

FIG. 35.—Ergographic tracings showing the amount of work done when a weight is pulled for 180 seconds

is an improvement on the continuous procedure but less satis factory than the other

In mental work it is important to secure that the rest is not so long that the advantages of incitement will be lost without equivalent gain, nor so short that it does not accomplish its purpose The right proportion of rest to work does not go by arithmetical progression, so that twice the amount of work requires twice the amount of rest, instead the ratio of the rest is found to increase as the work becomes prolonged

The most startling result of *mental fatigue testing* comes from the classic experiment of Dr Arai,[1] carried out under the direction of Thorndike After practising herself in the mental multiplication of four figure numbers by four figure numbers, she performed this task on four consecutive days from about 11 a m to about 11 p m, unintermittently and without food, doing 67 examples a day Her average efficiency during the last half hours of each day is estimated at not less than 75 per cent of her initial efficiency, her average time per example on the first day was 9 47 minutes and on the last 7 45 minutes and her errors averaged 1 5 and 2 3 on the two days The incentive of the experiment no doubt played a large part here, and it looks as though, given sufficient incentive, real mental fatigue in the sense of loss of efficiency is difficult to achieve

The school problem would appear to be mainly one of main taining interest and supplying the right variety, so that one set of organs and nerve-centres can recuperate while another operates The most valuable function of objective fatigue is perhaps to secure variety in thought and conduct for as in the universal competition for entry into the span of consciousness no new item can enter until another fades the perpetual process of *disparition* which fatigue ensures may be a chief agent in pre venting a stultifying fixation upon a single idea or task

[1] *Mental Fatigue* T Arai

CHAPTER XIV

REMEMBERING AND FORGETTING

IT now remains to examine that area of learning which is comprised under the heading of *memory*, in the sense in which James defined it, namely, as restricted to the knowledge of a former state of mind, cognitive experience, or item of information, of which meanwhile we have not been thinking, with the additional consciousness that we have thought or experienced it before

Such a definition rules out on the one hand the mere lag of perseverative effects, which cannot be said to be recalled since they have never faded from the mind, and on the other hand, such 'knowing as, by reason of its ease and familiarity, does not ordinarily assume the hall mark of a localization in the subject's past experience Nevertheless, the latter type of knowledge is not essentially different from memory recall, and can usually be substantiated from past experience when challenged, for example, a person may apply as a matter of course the knowledge that two sides of a triangle are together greater than the third when he wishes to take a short-cut, but he will not ordinarily refer the information to a specific geometric proposition, though he could probably give his original basis of knowledge if required to do so

The material so recalled can, as the definition shows be drawn from three main sources (1) a person's internal retrospection —his recall of his own previous acts and states as such, his own thoughts, desires, feelings and emotions his integral past experience, (2) the ideas and sensory percepts which have been previously cognized which may recur in a more or less casual and isolated way, (3) the whole body of information which he has acquired through communication, reading or his own

eductive processes—whether casually through the general environmental training, or systematically through the scholastic channels of education

The possibility of such retention and reproduction rests upon the *Law of Retentivity* with its sub-divisions the *Law of Facilitation* whereby *cognitive events by occurring establish dispositions which facilitate their recurrence*, and the *Law of Association*, whereby *cognitive events by accompanying each other establish dispositions to do so thereafter* These laws, however, do not in themselves explain why in actual fact *reproduction* need take place This would seem to be explained by the *Law of Span* or *Constant Output*, whereby *every mind tends to keep its total simultaneous output constant in quantity* It has already been seen how, mainly through the agency of fatigue, the process of *disparition* is perpetually withdrawing items from consciousness, if the span is to remain the same, it follows that their place must at once be taken by other items Thus this constancy of output accounts for the ideas being produced in consciousness at all, whereas the associations show why they are of one kind rather than of another, differently expressed, the constant output implies the generating of a certain amount of energy, whereas the associations supply this energy with paths of least resistance "[1]

KINDS OF MEMORY AND THE NATURE OF RETENTIVITY

There has been much discussion about the different kinds of memory Bergson made a distinction between *pure* memory, based upon a single experience, and *habit* memory, which is really the reproduction of an activity without its localized setting Investigations [2] were undertaken to see whether inter-correlations could be established between groups of tests dealing with both types separately, and whether at the same time negative correlation would be found between the two groups, the results seemed to bear out Bergson s distinction

Another and not altogether dissimilar distinction is made into *logical* or *substance* memory for meaningful material, and *rote*

[1] *Abilities of Man* Spearman p 271

[2] Notably that by M Smith and W McDougall Some Experiments in Learning and Retention *Brit Jour Psych* Vol. X 1920

memory The latter can only be tested in isolation by an attempt to eliminate meaning, as Ebbinghaus sought to do by the use of *nonsense syllables*

The second classification makes explicit a distinction which is implicit (though not perhaps the sole factor) in the first namely, the fundamental distinction between *eduction* and *reproduction* Where eductive processes are at a discount, as in the learning of meaningless material, the work of memorizing will fall upon retentivity, where insight can function once, it can function again, so that less of the burden falls upon sheer retentive power Put in another way, there is a difference in the kind and number of the relations educed for the formation of the associations which govern recall, these may be restricted to the narrow range of temporal sequence, or they may rise in tiers, as it were three-dimensionally, linking the presented material with rich systems of cognitive experience which embrace, and if necessary reproduce it, with little need for the more or less mechanical linkage which repetition sets up, as is assumed, by wearing down the synaptic resistances More will be said of this difference when the importance of meaning is considered

The distinction between noegenesis and reproduction raises the question of whether the two processes are in any way antithetical, since it has already been seen that no positive correlation is found to exist between them. ('All the available evidence indicates that *g* is exclusively involved in eduction and not at all in bare retention')[1] There is, however, no evidence for inverse correlation between them Somewhat surprisingly, it is found that retentivity although it enters into all cognitive operations, is *not itself a general or universal factor* It is usual to speak of a man as having a 'good memory," though this is sometimes qualified by saying that he has a good memory for figures,' or for faces, but not, for example, for names It is the latter view which is borne out by experiment There is some slight indication of a common factor in tasks of specific memorizing, which may be due to the common influences to which the whole brain is subjected, or to the common method of procedure which an individual adopts throughout all his

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attest This method has given much information about the conditions which govern fidelity of report

The *schoolroom use* of these methods for scholastic material is a subject which has received too little consideration in the past. The Method of Retained Members held almost entire sway, verbal or written recall was almost the sole mark-earning achievement With a kindly teacher or a backward pupil, the Prompting Method was sometimes conspicuous in the recitation lesson More recently composition based on the exhibition of a picture has had some vogue, not so much for testing memory perhaps, as for interpretation, or for supplying subject matter in a convenient form It is Ballard s noteworthy achievement [1] that he has set out to systematize the pedagogic use of most of the above methods, in order to supply more objective and standardized means of evaluation of pupils knowledge Since for scholastic purposes the method of Retained Members generally requires the use of coherent language, and this in itself is a significant mental exercise, he has endeavoured to reduce this *essay* factor, and even to eliminate it where it is not the ability which is being deliberately marked, hence his employment of the other methods The Method of Recognition is employed in the True-False tests, the Method of Right Associates in the tests requiring completion by the filling in of the right word, either by recall, or by a further use of recognition in its identification from among several given this method has generally had some vogue in grammatical exercises, where, for instance, the right form of the adjective has to be inserted before the noun The Method of Reconstruction is employed by Ballard in several ways, such as the matching of facts and dates, causes and events, or the arranging of facts in chronological or serial order, as, for example, in a cookery test when the items and processes of a recipe are given but have to be put into the right sequence

Every teacher should bear in mind that recognition is an easier process than recall, so that first exercises with new material will best promote learning if they encourage the pupil by simple recognition exercises (generally introduced by *pick out underline*, etc.) before requiring him to recall Also recall in a definite order

[1] See *The New Examiner* Ballard.

is, for discrete material, harder than mere recall, and should not be required unless the serial order has some logical value

Memory, as already stated, is taken to include (*a*) committing to memory, or memorizing (*b*) retention, (*c*) recognition (*d*) recall

Most of the experimental results concern the first process Memory training consists actually in improving the methods of learning Before considering the recommendations which have been made in this field, it will be well to review the far less definite and scientific knowledge which obtains about the other aspects

Retention—Hardly anything is known about the conditions which govern retentivity As has already been indicated, very little has been known even of its elementary nature By the use of the correlation method, the London School has made some essays at locating its range of manifestation and at determining its relations to other factors As to its basic nature and origin, it can but repeat the common hypothesis of a physiological explanation Hardly any suggestions can therefore be made for its control or influence beyond the usual recommendations to avoid deleterious effects of ill health, fatigue and drugs [1]

Recognition—Spearman [2] defines this as at bottom merely a special case of awareness of the relation of identity It may be that the object itself is recognized as identical, as when a man recognizes his own dog, or that some character or attribute is so recognized, as when a man recognizes the breed of another dog as that of his own Very often the relation of identity has to be inferred from similarity, as when the owner recognizes his book by inference from a scratch on the cover

Identity may also be inferred because the previous cognition gave rise to an *effect* which is regarded as similar or identical to the present effect, and serves as a means of identifying the cause, as when an uneducated or unmusical person recognizes classical music by its soporific effect upon him Moreover, sometimes the previous cognition of the object has faded from consciousness and has to be revived by an association of similarity before it can be compared and identified with the object of the new cognition

[1] Cf *Directing Mental Energy* Aveling Chapter on Memory

[2] *Nature of Intelligence* pp 312 ff

At other times the original cognition cannot be so revived but remains subconscious and so cannot rise to clearness These two conditions probably account for many of the eerie feelings of imperfect recognition, as soon as the item is definitely recognized as identical with a recalled experience, the sense of uncanniness passes Often the term defying introspection is merely an attribute or is related only by similarity The well known sense of having " been there before," when a new place is visited, probably represents just such imperfect recognition, some feature such as the lay-out of the village, the architecture, or the site, may seem vaguely familiar through similarity, or the subject may be unable to recall a previous visit, or the seeing of a picture of the place Recognition is improvable by better original learning, but psychology can give little guide about its direct improvement Practice in special classes of recognition may teach a person when he can rely upon his feelings of familiarity and when they are untrustworthy

Recall—Not very much is known of the factors governing recall as distinct from those governing the memorizing process The revival of relevant, or even artificial associations on the knot in the handkerchief" basis, stands upon good ground, however much the intellectual value of the associations may vary When an umbrella is discovered to be missing the owner usually reviews the day s activities, the places visited and so on. Sometimes relaxation, or the inhibition of worrying thoughts, causes the missing item to emerge in consciousness Conation commonly outlasts cognition so that a train of thought once set in motion often issues in a solution when the mind has been con sciously directed elsewhere On the other hand, the strength of the conscious conation to remember often works wonders, the examination candidate sometimes finds that he knows far more of his subject than he ever dreamt, and anyone who had just written a final examination under the false supposition that it was a practice test would probably be justly aggrieved, even though he had ostensibly been doing his best—for the test

The essential nature of recollection would appear to be either the *eduction of a correlate, followed closely by an act of reproduction,* when imagery plays its part, or a kind of *inward observation* when the mind runs over the experience stored in the sub-

conscious, and in the course of this exploration the required item stands out clearly in introspection.

Lastly, some reference must be made to the signs by which cognitive events are recognized as belonging to the past instead of to the present Endless confusion would arise unless some indications served to distinguish the two classes There is for one thing a certain vagueness and loss of detail which arouses relations of unlikeness with the present and so prevents identification Secondly, relations of temporal sequence are educed, as time runs on,[1] one event is cognized as *after* the other, moreover, time sequences become as it were built up into duration blocks, through the eduction of constitutive relations, and these blocks are cognized eductively as 'not now, or past, by relations of oppositeness, reinforcing those educed from vagueness Further, an item of experience becomes welded with the recollection of the circumstances originally accompanying it, not successively but simultaneously, which form as it were a 'co-existence block', as when a person can never recall or re read a particular book without remembering it as read upon a certain voyage, the affects of which still seem to tinge it with a reminiscence of motion and ozone There is also the whole range of official time scheduling—clocks, calendars, dates—by which to associate past happenings It is possible also that there may be more subtle subjective factors than are yet realized, one of the mysteries of the time sense is the remarkable exactitude with which hypnotized persons afterwards carry out to time orders of which they have no conscious recollection

It is worth noting that whereas a full and busy time table or a crowded sequence of events makes time seem to pass quickly, and a monotonous, uneventful period makes it seem long, in retrospect the empty period seems short, and the crowded one long by inference, because so much is remembered to have happened in it

Memorizing—The ground is now clear for a consideration of the factors which have been experimentally shown to 'improve memory' by *improving the methods of learning*, both in the

[1] Cf *Outline* McDougall, pp 306-308 and *Nature of Intelligence* Spearman Ch. XIX.

interests of more efficient knowing, and of effecting an economy in the time required for learning

Approximately the various recommendations may be said to fall into two main groups, namely, those concerned with the eductive processes, which promote the understanding, integration and association of what has to be learnt, and secondly, those concerned with the reproductive processes which throw light upon the most satisfactory applications of the law of frequency The distinction is not complete and some overlap will arise, but on the whole the conditions can be dealt with in this order

There is, however, one factor which pervades both processes and that is the right direction or conative control of mental energy, known as *attention* Without the application of *g* to the task in hand, multiplicity of repetition is practically useless, experiments with *passive* learning show that nonsense syllables which took 204 repetitions to learn passively could be relearnt actively in four repetitions This was the weak point about much of the old fashioned simultaneous table and spelling recitation There was no guarantee that individuals were actively attentive, or, even if so, were attending to the relevant features of number or letter combinations, and not to extraneous factors, such as pitching the right note or keeping the pace of the chant

It follows therefore that all learning is superposed upon the conations dependent upon inborn propensity and other primordial potencies, and upon all the influences of environment and training which commonly determine interest and attention of which the reader was reminded in the preceding chapter They were dealt with in Part I, and will be taken for granted here.

FACTORS AFFECTING THE RANGE AND EFFICIENCY OF THE EDUCTIVE PROCESSES

Memory, as has been shown, is closely connected with the law of association whereby the combination in which events are cognized largely determines the combination in which they will be subsequently reproduced The associations, it must be noted, lie not between the objective external events themselves, but between the subject's acts of cognition of them, between the mental events which are thus combined. This primary process

of relating cognitive items must necessarily depend upon eduction, although the chain in which they recur may be subsequently determined by associative reproduction. The present discussion is concerned with the evidence, experimental wherever possible, bearing upon the importance and best methods of promoting multiple eduction.

Meaning.—The most comprehensive single expression of this essential is the dictum that learning is most effective where the material is meaningful and is intelligently grasped by the subject. Logical understanding and frequency of repetition are necessary in inverse ratio to one another. This is commonly submitted to experiment by the learning of logical matter and of nonsense syllables for comparison of time or repetition required. In an experiment[1] conducted by the writer in which twenty students were the subjects, several series of ten nonsense syllables were learnt, each series for 80 seconds (about eight repetitions), after which a prose passage[2] containing 166 words and 67 ideas was read aloud for 80 seconds (about 1½ readings). The average number of *nonsense syllables* (of three letters each) learnt by the subjects in 80 seconds was 6.6, the average number of actual *words* correctly reproduced in the prose passage was 65.8, and of *ideas* 40.7. Further, as an intermediate comparison, a list of twenty words,[3] each one related to the next in a readily appreciable train of associations, was read aloud once at the rate of one a second, with an average result of 17.8 correct reproductions.

These results teach the lesson that the richer and more reliable the associations which can be formed, the more economically and effectively will the material be learnt. In the nonsense syllables learning, certain relations are educed, notably those of time (serial order) or of place (in visual presentation), as well as an introspectible variety of other relations, chiefly of similarity, dependent upon individual factors; thus some subjects are reminded of people's initials, or of real words, or weave a sequence of syllables into some sort of phrase (e.g. cur lin vos may be remembered as "curling fox"). But these are bound to remain

[1] See Experiment 11.

[2] "The Marble Statue." Manual of Mental and Scholastic Tests, Whipple, p. 209.

[3] Actually those given in McDougall's *Outline*, p. 303.

cramped and forced in comparison with the wide range of relations and correlates which knit the understanding of any consecutive passage into successively higher integrations of meaning

The use of *mnemonics*, or artificially formed associations, is sometimes recommended, and has had a vogue in the rhymes of Latin Grammar and of the syllogistic forms of logic It can be legitimately used as an economy measure where rote learning of discrete material is required, so long as it does not interfere with more important associations, and is in a form easily available for use in the relevant connexions

Use of Various Sensory Channels—Learning is helped and especially in class work where individual differences of preference could not otherwise be met, by presenting material through as many perceptual channels as possible This again increases the number of eductions which can be made, and further relates them into more complex wholes, so that sight, sound and movement, for example, can reinforce and reproduce one another by association This can easily be tested by learning nonsense syllables by seeing or hearing them, or by combining one or both methods with the movements of articulation or writing, the mixed method usually scores highest A useful test with logical material is that on 'The Value of a Map' given in Valentine's *Introduction to Experimental Psychology* (Experiment 27) Two pieces of fictitious history of equal difficulty are given one is accompanied by a map, showing routes, etc, with names and dates printed, to represent the ordinary blackboard use, both are read aloud, and the readings timed to be of the same duration, names and places are pointed to during the reading of the piece with the map After each piece answers to thirteen short questions are written down The writer *found a gain with a group of twenty nine students* of 40 per cent. correct answers in favo[illegible] with the map on immediate testing, and w[illegible] re tested without warning after nine days, th[illegible] to 56 per cent [1]

[1] It is a good thing to alternate the [illegible] pieces taken and [illegible] this factor [illegible] in a p[illegible] with reversed [illegible] 43 8 p[illegible] testing, [illegible] twelve d[illegible]

The use of rhythm has often been noticed as helpful, this would seem to imply the establishment of kinæsthetic associations Colvin[1] has noted another aspect of this factor, he quotes experiments at the University of Illinois which showed that one of the greatest distractions in learning is to oblige children, especially young children, to keep perfectly still, results of nonsense-syllable learning showing a considerable superiority when they were allowed to fidget and gesticulate, instead of sitting still with their hands folded No doubt another factor enters here, namely, the division of attention to the two tasks—sitting still and learning Of cognate interest is Colvin's reference to experiments indicating that writing seems to be a hindrance to learning until the upper parts of the primary school, because it is not sufficiently mechanized for the younger children to employ it without a serious distraction of attention to the letter formation' [2]

Use of Imagery—It was formerly assumed that the type of imagery used would be controlled by the type of percept, but it is now realized that subjects who are weak in one type of imagery but strong in another may translate their mental experience into the type which serves them best[3] The whole question of imagery and its function has been dealt with in Chapter XI It only remains to note that some educators advocate the more deliberate cultivation of imagery in pupils, especially in literary appreciation, and that Jaensch considers that the period of eidetic imagery is prolonged in children whose education encourages it

Avoidance of Wrong Associations—It follows from all that has been said about the importance of educing the correct and most prolific relations for associating experience, that it is o great importance to avoid the formation of wrong associations Thus testing should not ordinarily precede teaching or errors are unduly liable to occur and make an initial impression as, for instance, happened when spelling was taught by means of daily unseen dictation Corrections should take place as soon as possible after performance so that errors are speedily detected and the right forms emphasized Mechanical sequences

[1] *The Learning Process* p 169 [2] Op cit p 168
[3] Cf the example given on pp 201 20 above

which will be a hindrance afterwards should be avoided Thus tables and Latin declensions learnt by rote do not give the quickest cue to revival of a particular item unless counteracted by practice in dodging' Allied to this matter is the next point for consideration

Learning of the Reaction Required—Much earnest endeavour has gone astray in the past, through failure to take account of what exactly the pupil was learning in a given process, whether, for instance, he was learning chanting or multiplication, the writing of neat figures or arithmetical agility In these examples, the difficulty hinges upon the limited span of consciousness, and the consequent need for directing energy to the desired features of a process If a pupil is given words to look up in a dictionary he will improve at looking them up, which may be the point intended, but if he is required to know the meanings this should also be indicated and tested The psychology student who uses a table of squares or a slide-rule in finding standard deviations, gains facility in either of these operations, but does not necessarily remember a single square unless he has some additional interest in noting them

A second set of considerations arises from what has already been said about the *limitations of transference* No operation is removed from the setting in which it was learnt without some loss in the breaking down of the associations so formed, and in the educing of new relations to take their place. Such is the drawback of all stereotyped procedure of method and example which is not related to the situations of daily life, hence the complicated hypothetical sums worked by the child before he leaves the primary school do not always equip him to calculate his insurance contribution when he starts work.

Learning by the Whole or by the Part Method[1]—Few topics have had more experimental attention directed towards them than the relative merits of whole and part learning Differing results have been found, but the consensus is generally in favour of the whole method Yet there seem to be considerable individual differences It is possible that habit is a deciding factor, so that those brought up on the part method lose by trying the

[1] See Experiment 12

whole method, this would be no argument for not bringing up children on the whole method if it is proved to be better Possibly, however, pedagogy has been too much impressed by the one oft-quoted young man[1] who learnt 240 lines of a poem by reading the whole section three times a day for ten days, taking 348 minutes in all, and another 240 lines of it by the part method, learning thirty lines a day, then reviewing the whole, and taking twelve days and 431 minutes for this method, thus effecting a gain of 83 minutes in favour of the whole method

The present writer, after collecting the results of some hundreds of students working on a carefully standardized procedure, can but quote the following results for a particular group of forty subjects as more or less typical of the rest Two passages of ten lines each from the same poem were chosen and a slight difference between them in numbers of words balanced by having each poem learnt by twenty subjects by the whole method and twenty by the part method, also half began with the whole method and half with the part method Results were as follows —

Learning of ten line passages by forty subjects

	Mean time taken Minutes	*Mean number of words correct*
By Whole Method	12 3	75 9
By Part Method	12·7	74·7

The passages were short, but similar experiments with passages of twice the length have yielded similar results

The most important advantage claimed for the whole method, however, is its greater permanency The following table is quoted by Gates[3] from Larguier des Bancels in support of this, though Gates does not give the number of subjects from which it was obtained

[1] Recorded by Pyle and Snyder 1911

[2] For the last twenty subjects a maximum time limit of 15 minutes was imposed for each learning though very few of the preceding twenty subjects had exceeded this

[3] *Psychology for Students of Education* p 292

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Learning by the Whole or by the Part Method[1]—Few topics have had more experimental attention directed towards them than the relative merits of whole and part learning Differing results have been found but the consensus is generally in favour of the whole method Yet there seem to be considerable individual differences It is possible that habit is a deciding factor, so that those brought up on the part method lose by trying the

[1] See Experiment 12

whole method, this would be no argument for not bringing up children on the whole method if it is proved to be better Possibly, however, pedagogy has been too much impressed by the one oft-quoted young man[1] who learnt 240 lines of a poem by reading the whole section three times a day for ten days, taking 348 minutes in all, and another 240 lines of it by the part method, learning thirty lines a day, then reviewing the whole, and taking twelve days and 431 minutes for this method, thus effecting a gain of 83 minutes in favour of the whole method

The present writer, after collecting the results of some hundreds of students working on a carefully standardized procedure, can but quote the following results for a particular group of forty subjects as more or less typical of the rest Two passages of ten lines each from the same poem were chosen and a slight difference between them in numbers of words balanced by having each poem learnt by twenty subjects by the whole method and twenty by the part method, also half began with the whole method and half with the part method Results were as follows —

Learning of ten line passages by forty subjects

	Mean time taken *Minutes*	*Mean number of words correct*
By Whole Method	12 3	75·9
By Part Method	12 7	74 7

The passages were short, but similar experiments with passages of twice the length have yielded similar results

The most important advantage claimed for the whole method, however, is its greater permanency The following table is quoted by Gates[3] from Larguier des Bancels in support of this, though Gates does not give the number of subjects from which it was obtained

[1] Recorded by Pyle and Snyder 1911

[2] For the last twenty subjects a maximum time limit of 15 minutes was imposed for each learning though very few of the preceding twenty subjects had exceeded this

[3] Psychology for Students of Education p 292

Number of words recalled after one week

Lea ned by Part Method	*Learned by Whole Method*
26 6	40 6
After two years	
6 4	16·6
Per cent recalled after two years	
24	40

A factor to be remembered is that in experimental procedu both methods are carefully separated, the whole method may n be deviated from for the strengthening of weak parts, and tl part method usually allows only one final consecutive readin In ordinary life no one would restrict himself on such arbitra lines, and a mixed method would probably prove best. Tl investigations have helpfully stressed that the *first* approach the learning of a logical passage at any rate should be through tl whole method It may be well to set out the arguments usual brought forward on both sides

The Whole Method ensures a more intelligent grasp—tl sense can be understood better and in wider units of meanin The connexions are formed in the way in which they will l required later, and this is specially important in the learning recitation and dramatic passages A more concentrated atta is generally made because the task seems greater, and this act direction of mental energy is probably an important facto Further, the repetitions of the items included are better di tributed a point to be considered later As has been see claims have been made for the greater speed of learning a permanency of retention by this method, especially in the learni of poetry, prose, and lists of words or nonsense syllables whi are required to be memorized in serial order

The *disadvantages* of the method arise from the discourageme which children find when nothing has been actually learnt l heart at the end of a period, in a recitation lesson, for instanc and from the difficulty that the teacher may find in havi no immediate criterion of effort or progress One way remedying this is to choose such short poems that they can l learnt as a whole in one period which unduly restricts choice

good verse and is apt to encourage doggerel, as well as depending upon the accumulated method of learning The undiluted whole method may also have a fatiguing effect, as it involves a good deal of seemingly unnecessary repetitions of known parts how ever much these may make for permanency of retention, intro spection reveals (in some cases at least) that learning takes place from the beginning of a passage, so that the lines learnt first are overlearnt many times before the end is reached

The Part Method though it provides the encouragement of appreciable progress and can be "heard' by the teacher, has some great inherent disadvantages if followed entirely It cuts up the meaning into segments and is less likely to produce sound comprehension The tendency is to set about learning in a more passive way, since the task seems easier, and the bunched repetitions of short sections forfeit the advantages of a more 'spaced" learning Not least is the objection that wrong associations are formed, which in recitation especially are apt to embarrass the performer by leaving him stranded between the stanzas, his connexions have been formed more strongly between the end and the beginning of the same verse, and there is a weak link between the end of one verse and the beginning of the next This objection would seem greater in proportion to the greater number of sub-divisions so formed

Perhaps the best advice is that each teacher should experiment for himself and find out what suits his pupils best Children enter very readily into an experiment of this sort, and it has the useful effect also of drawing their attention to the existence of good and bad methods of learning and the importance of taking them into account

The Relative Merits of Attempted Recall and Continuous Reading —The consideration of this point seems to lie mid way between the factors mainly influential upon the eductive processes and those more concerned with the reproductive processes American writers use the word recitation for any attempt to say over the matter learnt. Experiments upon the relative efficacy of going on reading over the material (whether it be nonsense or meaningful), and on the other hand of trying to recall between readings without looking at the book, except for self prompting upon every breakdown have given the following illuminating table of results —

RECITATION *VERSUS* READING (FROM GATES)[1]

Material Studied	16 Nonsense Syllables, Per Cent. Remembered		5 Biographies — Total 170 Words Per Cent Remembered	
	Immediately	After 4 Hours.	Immediately	After 4 Hours.
All time devoted to reading	35	15	35	16
1/5 of time devoted to recitation	50	26	37	19
2/5 of time devoted to recitation	54	28	41	25
3/5 of time devoted to recitation	57	37	42	26
4/5 of time devoted to recitation	74	48	42	6

The ' recitation method seems to ensure a more active approach, the learner is encouraged by his progress but made aware of his weak spots so that he is able to strengthen them Probably, too, it is a greater challenge to his understanding, a fact seen in print is apt to be taken for granted, whereas when reproduction is attempted its character is queried, perhaps by the very mistakes made in trying to reproduce it There is the further value of learning the reaction required when, for instance, the passage is one for subsequent recitation When preparing for a written examination, the student is probably best helped by attempting *written* recalls between reading

FACTORS AFFECTING THE EFFICACY OF THE REPETITION

By the Law of Facilitation, or, in other terminology, the Law of Frequency, cognitive events should occur more easily for having occurred before, and this means that the more often an event occurs, other things being equal, the more likely it is to do so again Some of the conditions which must be equal for this law to take effect have already been discussed, but it remains to deal with those which are involved in the number, arrangement and rate of the repetitions themselves The Law of Fatigue has already been dealt with as working in constant opposition to the Law of Facilitation, and must be kept in mind as a determining factor, though it will need no further exposition

[1] *Psychology for Students of Education* Gates p 270

The factors of *Primacy* and *Recency* have been given the status of laws in the behaviourist terminology They stand for the two indubitable facts that those items which are presented first and those which are presented last in consciousness, during any given operation, occupy positions of advantage and are better retained In a group of twenty subjects tested by the writer, a set of fourteen words was read aloud once and the subjects asked to write down all they could remember immediately after the reading of each set, twenty subjects recalled the first word, and nineteen the last, whilst the seventh and eighth words were both recalled by two subjects only

Explanation of these facts probably lies partly in *perseveration consolidation and retroactive inhibition* By the *Law of Inertia* cognitive processes always both begin and cease more gradually than their (apparent) causes Spearman, as has been said, further finds that individuals differ in the extent to which they tend to perseveration, but the lag exists for every process in some degree, so that the energy or power of g is never switched into new operations quite instantaneously Many psychologists have assumed a physiological correlate to this mental trait, and have presupposed some sort of molecular set following upon neural activity, and, as it were, building in the new modes in which the nerves, and especially the synaptic junctions, have been exercised—thus reinforcing the bonds of association This speculation which sounds feasible enough has been developed partly by analogy with the observed characteristic of muscular learning which is embodied in the common saying that we learn to skate in the summer Ballard[1] claims to have discovered experimental proof of an improvement in capacity of recall occurring between immediate recollection and delayed recall, which he terms *reminiscence* On testing 6000 subjects he found that when a child has memorized poetry, prose or even shapes of drawings, he can generally remember more after a lapse of a few days than immediately after learning the improvement grows less on the whole as the subjects advance in age some measure of it was found in 30 per cent of training college students, 75 per cent. of older children and 90 per cent

[1] Obliviscence and Reminiscence Monograph Supplement Vol. I *Brit Jour Psych.*, 1913

of infants This seems to bear upon the general belief in the greater plasticity of the immature nervous system

Given this general concept of mental lag or inertia, with its probable physical aspect of consolidation, it is easy to see that an immediately subsequent event, which disturbs this aftermath, will exercise *retroactive inhibition*, or in other words will weaken the effect and permanency of its predecessor Thus, in every day life it is the 'parting shaft' which rankles, and the first impression which counts for so much, for it has a clear field behind it and no perseverative effects to interfere with it. Educational implications are numerous The value of pauses and of final summaries, the importance of plunging into a subject without delay, the order of subjects on the time-table, all call for review And these questions are closely bound up with the factors to be dealt with next

Length and Distribution of Practice Periods—The bearing of these considerations upon the learning of non ideational material and of more or less stereotyped performances, such as Starch's substitution test, was discussed in the last chapter The issues are not so clear with the memorizing of verbal (even nonsense syllable) and ideational material As regards *length*, the consensus is in favour of shorter periods for younger children, school periods of 15 30 minutes, especially where class instruction is concerned, and even in upper classes, periods of over 45 minutes (except for such complicated practical subjects as cookery and agriculture) are probably wasteful On the other hand, longer periods of self-study may be productive with older pupils and adults There are individual differences to be considered, perseverators will take some time to get into their stride and will do better by continuing longer non perseverators who can drop quickly into a new task often do better in short shifts Short breaks in prolonged study periods may be useful to counteract fatigue effects in either case Care has to be taken not to lose the benefits of the initial warming up, and so drop below maximum output unnecessarily soon, and before its fruits have been reaped

Distribution of periods is bound up with length since normally time has to be shared among a number of subjects of study Up to a point there seems to be an advantage in spaced distribu

tions, that is, in a lapse of time between repetitions On the other hand, if the interval is too long and the previous impression has already faded, waste occurs If the allotted amount of time or repetitions is fixed, then spaced learning will allow more occasions for consolidation or sinking in Jost's Law, though it throws no light upon the causes formulates some of the facts thus 'When two associations are of like strength but of unlike age, repetition increases the strength of the older more than of the younger associations When two associations are of equal strength, but unlike age, the younger fades more rapidly than does the older This sums up the case against short intensive courses and against cramming, as good results may be obtained temporarily, but they have not the same degree of permanency

Speed—Individuals differ in the learning pace which suits them best, but on the whole meaningless material is retained best when learnt slowly, whereas for intelligible material there seems to be a positive correlation between quick learning and retention Speed probably means better direction of *g*, stronger concentration, which makes also for better comprehension The question has been studied in connexion with speed and comprehension in reading[1] O Brien speeded up the reading of school pupils in different grades to the extent of 45 per cent to 75 per cent gain after thirty nine days' training, and in the majority of cases this was accompanied by a gain in comprehension of the matter read There is, however, a point beyond which speed cannot be pushed without a loss in comprehension

Overlearning—Learning just up to the point of recall is uneconomical except for material which is only required upon one occasion as, for example, the barrister s case and the after dinner speech The strength of subsequent retention is increased by further repetitions, so that an overlearnt item may even become a permanent possession, at least until the decay of senescence Most of the material required to be learnt by young children is of the kind which is needed for life and should be overlearnt by constant repetition and exercise, this is true of all the foundation work in the three R.'s,' as also in the

[1] See *Oral and Silent Reading* Stone, Ch. II

acquisition of symbols in other subjects, such as musical notation geometrical forms and map-reading A good deal of the poetry and prose learnt at this stage should be intended for permanent possession But great discrimination is needed by the teacher to effect the best economy, he should, for instance, remember that, though a good reading vocabulary can hardly be too much overlearnt, the subject matter of a sub-standard reader is not generally of equal importance The case can be quoted of a standard IV pupil who could still recite the sub-standard reader from cover to cover, here time had been wasted upon the overlearning of useless material which would have been better spent in learning a wider range of vocabulary

No doubt much more will yet be discovered about the most efficient means of learning, for the economical control of learning becomes steadily more important as the range of curriculum widens, and new acquisitions of scientific knowledge are added to the syllabuses As it is, the pupil runs the risk of a distressingly superficial range of half-learnt knowledge, the insecurity of which robs him of confidence in his intellectual equipment. The awareness that so much knowledge exists damps his power of original eductive thinking, whilst the inaccuracy of his own reproductive processes robs him of faith in the information of any but the experts, towards whom he becomes hyper-suggestible The startling probability, testified to both by the psychologists and by the anthropologists is that the recent immense increase in scientific knowledge which is becoming a part of our social heritage, has been accompanied by no improvement in mental power There is, in fact, no evidence for supposing that any advance in human intellectual endowment has taken place during the historic period Nothing can save mankind from being overwhelmed by this vast aggregate of knowledge, at the expense of personal poise and individuality, except a deeper understanding of the principles of systematization, and of their application to the external order of fact, and to the subjective powers of comprehension.[1]

[1] A useful list of practical "s[illegible] given in *How to Study Effectively* by G M Whipple

FORGETTING

Germane to the question of learning and remembering is that of forgetting

By the process of disparition, items are driven from consciousness, partly by the agency of fatigue, partly on account of universal competition for the limited span of consciousness, partly through the operation of conative control, and partly from the loss in clearness and facilitation which attends disuse Enough has been said of the first two causes Concerning the third, the reader will need only to be reminded of the way in which conation, or striving, is influenced by the law of pleasure and pain, to understand how unpleasant memories tend to be repressed, and pleasant recollections enhanced This will at least partly explain the proverbially rosy view of his own scholastic prowess which the parent presents to his offspring and the glory which decks the past for most old folk. The law of disuse represents the converse of the law of facilitation, it does not operate until the perseverative effects have worn off, and Ballard s already quoted investigation would suggest an even longer interval, at least in some children and in a lesser number of adults The earlier investigations quoted below give no hint however, of this possibility of improved reminiscence, which may be due merely to greater freedom from fatigue effects after an interval As a general law, it may be taken that cognitive events by not recurring decrease their liability to do so

Over and above such explanations of normal' psychology, are the doctrines of the psycho analysts who believe that no past experience is ever lost, but that, if it does not occupy a place in the conscious or the foreconscious, it is no less significant in the unconscious All repressed wishes are thus driven into the unconscious and account for slips of tongue, forgetting of names and appointments and so on, as well as for the wide amnesias which obtain for the early years of life, and for much of dream experience Without reverting further to these theories, or denying them the possibility of truth partial or otherwise the argument must pass on to consider the mechanism of forgetting as revealed by objective laboratory experimentation

The main facts are embodied in the Curve of Obliviscence

which Ebbinghaus procured by the Learning and Saving method used with nonsense syllabus After a subject has been practised in the learning of nonsense syllabus so that he has acquired a steady average rate, he *is tested in learning at intervals various* sets of nonsense syllables, each one of which is relearnt at a different interval from the original learning occasion The repetitions saved, in comparison of the second learning with the first, are plotted as a measure of the traces existing beneath the threshold of recall The curve given below reports that this subject took 26 repetitions to learn a series of syllables just

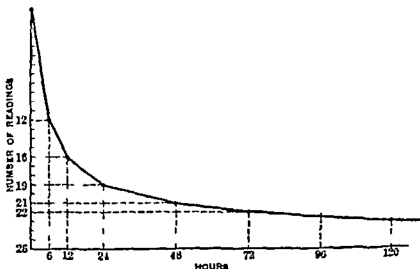


FIG 36—The curve of Oblivisecence (*From Ebbinghaus*)

to the point of recall, and after 6 hours, 12 to relearn, thus saving 14 repetitions, after 12 hours 16 were required, thereby saving 10 repetitions, and so on

The curve shows that the quickest rate of forgetting occurs just after learning After a day or two, forgetting proceeds more slowly, and this retardation steadily increases, so that the zero line is probably never reached. Thus even years afterwards something may be saved in relearning a subject of which nothing can be recalled

A practical deduction from the curve is that it is economical to revise material soon after learning, in order to counteract

the great and wasteful drop which occurs so soon as the perseverative effects have worn off Later revisions can be spaced at progressively longer intervals Thus in the learning of spelling, newly learnt words should be revised and tested immediately, the next day, after a week, after two weeks, a month, a term, and so on through the year, and this building up of a permanent list will provide the pupil with a lasting possession of written vocabulary with the minimum of effort. Education has been described as " what is left when what has been learnt has been forgotten " The pertinency of this lies in the fact that what remains after a number of years is a more or less permanent possession, since its further disparition proceeds very slowly A further corollary is that, of two retained items of equal strength, the older is really in the better case, since it has less ground still to lose than has the more recently learnt item, and, as has been seen, profits most by further revision

The possibility of overlearnt material remaining permanently capable of recall has already been discussed No doubt it loses something of its fluency by the same temporal pattern of deterioration as is shown above The following curve from

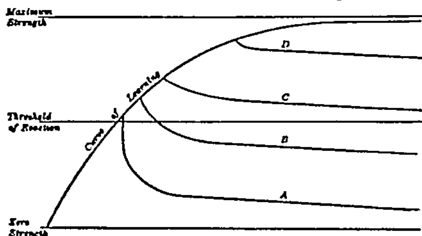


FIG 37—Curves showing probable influence of disuse in the case of functions overlearned in various degrees

Gates [1] represents the *probable* influence of disuse upon functions learned in varying degrees A shows the loss when the function

[1] *Psychology for Students of Education* p 259

is barely learnt, B, C and D show the same for functions overlearnt in different degrees Loss of skill is thought to follow the same course, though skill deteriorates more slowly, probably because it is more often overlearnt

Forgetting must not be regarded merely as a necessary evil Mental life is necessarily selective, and only so can order and system be brought into the pattern of the complex structure of belief and knowledge which each individual rears for himself in the course of his lifetime, and without which it would be impossible for a person to maintain his sense of identity and personal continuity It is this individual storehouse of memory, representing the synthesis of a life's experience, which McDougall[1] thinks gives strongest support to a belief in the survival value of personality in contradistinction to the bodily habits which obviously cease with the disintegration of the nervous system, whether partially through disease, or totally at death

[1] *Body and Mind*, Ch XXVI *Modern Materialism and Emergent Evolution*, Ch IV especially p 101

CHAPTER XV

THE HIGHER THOUGHT PROCESSES

THE noegenetic principles set forth in Chapter IX were described as covering the whole range of the thought processes It has already been seen how they apply to the domains of perception and learning It remains to show how the traditional terms of the so-called higher thought processes admit of noegenetic analysis The logical and philosophical classification may be set out as follows, although the first type of reasoning has hardly been considered entitled to a place in the scheme —

1 Conception
2 Judgement
3 Reasoning
   (a) From two particulars to a third particular
   (b) Induction from particular beliefs to a general belief
   (c) Deduction from a general and a particular belief to a particular belief

These will be briefly considered in order Finally, the account given of *imagination* in Chapter IX will receive some amplification

CONCEPTION

It has been customary in philosophy and psychology to make a line of cleavage between the concrete and the abstract planes of experience, and to contrast *perception*, or the process of cog nizing material which is present to the senses, with *conception*, or the process of cognizing or thinking of material (concrete or abstract 'objects") which is not present to the senses, and is therefore considered as possessing an abstract and general character

Spearman defines a *concept* as "*any item of cognitive content that by verbalization has become comparatively stable*"—that is, more or less stably fixed in the usage of a person or a society"[1] It is the crystallization into language which gives this stability to concepts They thus become like molten bullion poured into coining moulds, whence—after due rolling, punching and pressing—they issue as legal tenders for general circulation"[2] Just because of this fixity, however, they cannot cover the field of cognition continuously, their range can, for instance, never show all the graduations of perceptual quality, shades of blue may merge imperceptibly into one another through all the grades of brightness, but concepts can do little more than classify into light' or dark blue "Of such disjoined verbal concepts a man amasses in due course from about a thousand up to a hundred times as many, according to his ability and culture Conception may be said to possess no brush or palette, but only a box of mosaic stones"[3] Nevertheless, these concept names, originally acquired for communication, exercise a powerful influence upon a man's thought processes 'With some of them he seeks to fit every object or situation that presents itself They serve him as mental havens In thinking he flits from one to another as children do from post to post in the game of touchwood'[4] Thus mental outlook and assimilation tend to become bounded by the number and names of a person's pigeon-holes

It has sometimes been assumed that as conceptual thought is commonly contrasted with that which is perceptual, it is to be understood as covering the whole field of non perceptual or ideational awareness But this would denote an unwarrantable limitation of thought There would seem to exist beyond and around the crystallized concepts a fluid awareness," thoughts which cannot find expression in words—and that not merely through a temporary delay—thoughts which are imageless Spearman sums up the contrast between this preter-conceptual, notional awareness' and the conceptual mosaic in the following analogy[5]

[1] *Nature of Intelligence* pp 266 and 263
[2] Op cit. p 264
[3] Op cit p 265
[4] Op cit. p 265
[5] Op cit., p 276

"The cognitive field may, then, be compared to an ocean studded with icebergs Over much the larger portion, including not only sensation, but most thinking also, it is still fluid Only dotted here and there, has the thought frozen into verbo-conceptual rigidity"

There are three main ways in which concepts are formed, and three resulting types of concept, though they may be found in every degree of interfusion

1 *Disintegration*—Perceptual experience is itself fragmentary and patchy, yet as has been seen a certain unity pervades its operation One question for consideration is the way in which this unity becomes broken up so that characters can be conceived in isolation from their concrete embodiments, how, for instance, does a child come to understand the meaning of *hot* as separable from hot water, fire, sun, porridge and so on? First, such distinctions come to be made because perception increases in *clearness* and therefore in *determinateness*, and this necessarily brings greater differentiation, thus "hot" is more clearly perceived, by way of apprehension of sentience, relation eduction and supplementation, as it is repeatedly experienced Secondly, the *unequal distribution of mental energy*, which was noted in Chapter XI as characteristic of the pattern of attention in its varying concentration and diffusion, causes the item which focusses this energy most fully upon itself to stand out as distinct from the other items, thus when the child who burns his fingers has his energy especially drawn towards the flame's attribute of 'hot,' all other attributes such as 'bright' 'pretty," fall away into oblivion, and upon subsequent recall the one vividly perceived is reproduced without its marginal accompaniments

2 *Confusion*—A concept has usually been defined on the basis of its composite character, as a sort of highest common factor of a class of items, like the 'type' picture produced by composite photography

If the student will perform the experiment on concept formation[1] he will have the opportunity of introspecting his mental processes to see whether his final concept of the collective term for any one set of pictures does consist of a bare 'roll-out

[1] Experiment 14

'the country is financially sound,'' "the news is not satisfactory," where the former terms are of a more or less perceptual nature

(c) *The eduction of a relation between fundaments from the "fluid awareness"* which surrounds the verbalized concepts, as, for instance, in examining a sentence just written to find out whether its import exactly coincides with the subtlety of the thought which it is intended to convey, or in forming an impression of the style of a book

(d) *The eduction of correlates,* which regulates the use and understanding of language, thus, to say "Good is the opposite of bad is to make a self evident or noegenetic judgement.

In addition to these cases of true eduction the 'pure metal" from the intellectual standpoint, there are various extraneous elements which are included in the popular connotation of the term judgement [1]

(e) *Preliminary comparison and examination* of the items between which the relations are educed, in contrast to the immediacy of the pure eductive process, as, for example, when the items are weighed or measured, and not noegenetically known as like or unlike in weight or length

(f) *Endorsement* of an already held proposition which is not self-evident at the moment suppose a person sees two normal children of three and ten years old respectively, he is insightfully aware that X is the elder', but if there is only a year between them and no difference in size, he may be equally certain that 'X is the elder,' but for other reasons which depend upon past eduction or otherwise obtained information.

(g) *A volitional element,* as when a 'judgement is passed, after due deliberation, that "this one is preferable to the other the subject of an experiment who has to decide which of two not very unlike weights is the heavier may after careful deliberation decide upon one and stand by his opinion but this is quite unlike the new self-evident knowledge of the eductive process

(h) *Habit*, as when a belief is reproduced which may originally have been insightfully held but has subsequently become part of a person's stock in trade, of such a kind might be the weather prophet's remark that 'a south west wind always brings rain

[1] See also op cit. Ch. VI

(i) *Authority*, operating through the social environment and furnishing a host of beliefs not necessarily insightfully held, but accepted and retained such propositions are contained in rules, maxims, adages, proverbs, precepts, formulæ and doctrines, the weather prophet mentioned above may have built up his observations on experience, or it may be much on the level of his grandmother s lore, red sky in the morning, shepherd s warning '

These judgements derived from the quantitative principles of great social value and economy, are nevertheless the main sources of error in human affairs, because they may either be *obscurely held* through lack of insight and imperfect retention, or they may be *subject to illusion*, through personal bias and con ation from conscious or unconscious sources—a phenomenon already discussed on other levels, and of the same general origins here as there Such propositions have not the fresh intellectual quality of self-evident eductive judgements, and must be regarded as belonging to a lower mental process, in which *g* is less concerned, whatever may be the intrinsic value of their content Again, the educational need for first hand experience is borne out, the problem must ever be to adjust the nice balance of absorption of traditional culture with the training in original eductive thinking

REASONING

It has traditionally been claimed that logical reasoning in the form of syllogistic deduction represents the highest mental performance to which the human mind has yet attained Spearman examines the forms of this syllogistic reasoning to see whether it contains any mental processes not already ex plained by the laws of noegenesis, or any which require a unique mental power *sui generis*

The typical syllogism of *deductive logic* is

All M are P
S is M
S is P

And the time honoured example is

All men are mortal
Socrates is a man
Socrates is mortal

The first proposition is known as the *major premise*, and in its highest form is supposed to consist of a proposition which links two concepts, and is therefore of a universal character The second proposition or *minor premise* is generally of a semi perceptual character, linking a percept with a concept The two premises and the conclusion are considered necessary for valid reasoning, and according to the formula should always express the *relation of identity* Finally, between the premises and the conclusion there must be educed *a relation of evidence*

Induction has generally been regarded by the scientists as a superior form of reasoning, and by the logicians as inferior It consists of the building up of a general proposition from a number of particular instances, and therefore may be said to have very varying degrees of validity according to the analysis and selection of the particular examples Fundamentally it seems to rest upon a tendency of the mind to expect like events to have like effects, exhibited in its simplest form in ' a burnt child dreads the fire " It is responsible, not for the application of rules, but for their formation It used to be explained by associative reproduction giving rise to expectation of further repetitions, but it is more than this, for eduction certainly plays its part as well *Induction would seem ultimately to rest upon a deductive basis*, and to be subsumed under a general law, such as, ' natural events everywhere and always proceed uniformly , or, more plausibly, the belief that the universe is ruled by some ultimate causative law, and that nothing is haphazard, so that its particular manifestations may be expected to persist What is said of deduction may therefore be taken as applying to induction *mutatis mutandis*

The questions now to be considered are

1 Whether the syllogism as analysed above does involve any peculiar mental operations of superior sort

2 Whether in point of fact it does as it stands play a large part in the practice of ordinary life, with the converse question

of whether it is modified or supplemented by any other reputable modes of "rational" thinking

3 Whether any special ' intellectual " virtue lies in abstract as opposed to perceptual thinking

1 (*a*) The *major and minor propositions* of the syllogism may be of any of the kinds of judgement already considered, that is to say, they may or may not be expressions of the eductive processes, in which *g* is known to be especially operative.

(*b*) The *relation of identity* (though in point of fact not so prevalent as has been supposed) cannot lay claim to any superior status As was shown in Chapter IX, " Taking everything into consideration, the several kinds of relation are certainly not very disparate in respect of the degree that they make calls upon *g* There is, indeed, nothing to indicate that—when properly compared—they are even unequal at all ' [1]

(*c*) The same remark must be taken to apply to the *relation of evidence* " But there remains to see whether it may not, over and above its connexion with *g*, involve throughout its domain some additional factor [2] Two facts have come to light through the correlational method [3] First, when the relation of evidence was especially tested in the forms of Inference (e g If I can run faster than Tom, and the same as Harry, but slower than Dick, who will win the race, Tom, Dick, Harry or I ? ") and Likelihood (i e the subjects had to decide whether some given statements were quite certain, only likely, very unlikely, or downright absurd), and the scores compared by the tetrad equation with those for tests involving other relations, no appreciable overlap, or group factor, was found between them to distinguish them from the other tests of *g* When, however, tests of *Reasoning and Generalization* were compared by H A Peterson [4] with other tests of *g* the high specific correlation of 93 was found, though neither test showed specific correlation with the Abstract thought test [5]

[1] *Abilities of Man* p 208
[2] Op cit., p 224 and see pp 170-171 above.
[3] Op cit pp 202 and 2 4
[4] Op cit pp 169-172 and p 225
[5] Op cit., pp 225 226

Attempts have been made to measure the correlations of perceptual and of abstract tests with the scores gained in some standard intelligence test, with varying results, the problem has been to keep the perceptual and non perceptual tests equal in difficulty This was overcome by Davey[1] who used four tests of Analogies, Completion, Classification, and Questions, in dual form, linguistic and pictorial, with items of equal difficulty in both Two intelligence standards were also used, an abstract one, consisting of Inferences and Likelihood, and a pictorial one, consisting of Sequence and Enumeration The respective correlations of both types of tests were practically the same with both standards Strasheim[2] found, however, that though a progressive series of mazes could be solved by his subjects either with or without the power of formulating, and so abstracting, the rule, the abstraction carried with it some important results in accuracy and transfer of ability, and was more often achieved by the young bright subjects than by the old dull It could only be accomplished where relations could be very clearly cognized

The difference of performance upon the two levels, perceptual and imperceptual, would therefore seem to be one of *degre rather than of kind* Spearman sums up by saying [3]

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Presumably the ripening will, subject to the primordial potencies and the '*s*' factors, take place most effectively and most

[1] *Abilities of Man*, pp 212 213
[2] Op cit pp 215 216, cf p 252 of this book.
[3] Op cit. p 216

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IMAGINATION

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[1] *Nature of Intelligence* p 327

acted phantasy, or in outward quiescence and inner vividness, as in the case of the adolescent girl who ' wears a new silk dress every day, and lives in a palace with a piano in each room."[1] It was also seen how literary fiction expresses the dominant phantasies of the human race and provides an outlet for the reader by projection and identification, how also the delusions of the deranged may pass from illusions arising from false supplementations of perceptual experience on to full blown hallucinations[2] All the illusions of imperfect supplementation through personal bias and conation were seen to be the results of correlate eductions from faulty fundaments Similarly, the instances quoted above can be explained by the *eduction of correlates*, whereby a new fundament is thrown out "The wish is father to the thought" would then seem true of all this class of imagining, the initial fundament is some desire, the projected one the means of fulfilment.

Usually such a correlate eduction finds seemingly simultaneously, or with an introspectible interval, the *reproductive* dress in which it can best clothe itself in other words, it vests itself with images of a more or less concrete pattern, predominantly but not necessarily visual, less often *verbal* Hence the confusion which has failed to disentangle its manifestations from those of reproductive imagery In the types of fantastic thinking discussed above this element usually predominates, whether in eidetic form or not, and it enhances the compensatory satisfaction All this is practically independent of reality and does not require to be checked by the eduction of relations between itself and the actual situation, a process which would usually be painful so is likely to be avoided If, however, social or artistic expression is sought, then further prolific relations and correlates must be educed between the thought and the terms of expression

The third principle of noegenesis will also be found adequate to explain the inventions of science The scientific problem presents itself, and the mind, ranging experience to find a means of solution, may land upon it through some favourable synthesis of circumstance (such as the chance fitting of the two sticks afforded Köhler's chimpanzee), in such a way the proverbial

[1] Op cit. p 329 [2] Cf Ch. XI

falling apple is said to have given the cue of gravity to Newton, and the bobbing kettle lid the hint of steam power to Watt. Failing this the mind may have to wait for a more favourable concentration of mental energy upon the range of fundaments and relations, until the greater clearness of some relevancy produces a sudden leap into the void. Here, however, the educed correlate will be less likely to don a dress of sensory reproducts; it is more likely to remain as a "fluid fundament," a bare notional awareness, until it can find some verbal symbol in the necessary currency of a formula. The hypotheses of science are of this kind. There still remains the trial-and-error process of fitting them to the facts, of testing them out to see if they satisfy—whether on the purely mental plane or through the test tubes of experiment. Occasionally, however, some revelation of science or philosophy, coming as the crown of thought, may be simultaneously recognized insightfully as the only true and possible solution.

"From beginning to end, then, this alleged imagination, in the sense of the creative faculty of the mind, shows itself always at bottom some eduction of correlates, to which there may or may not be added an immediately following and intimately co-operating reproduction."[1]

To sum up: all the noegenetic powers of the mind are fundamentally creative and generative of new content. This creativeness far exceeds the narrow range usually attributed to imagination. For whether the process is directed towards truth-getting and the seemingly sober facts of science or philosophy, or towards phantastic fictitious creations, the mental process is the same, however different motive and content may be. Only so do men project themselves into the past with what is known as the historic sense, to relive the lessons of history or forward into the future to foretell the course of events or to try to avert the disasters towards which their race seems heading. Only so do they transcend the limits of experience and seek to explore the infinite and the transcendental. It is strange indeed that this, the most "god-like" power of the mind, should have been buried by the psychologists beneath the shards of sensory reproducts.

[1] Op. cit., p. 333.

PART III

METHODS AND PRACTICAL EXERCISES

CHAPTER XVI

METHODS OF PSYCHOLOGY

THERE are in psychology two chief spheres of observation First there is the observation of *experience*, of that "stream of consciousness' which behaviourists repudiate This mental experience is accessible only to the *experiencer*, so that its examination must necessarily be *subjective*, in other words, it must be *introspectively* undertaken

Secondly, there is the observation of *behaviour*, using the word as confined to manifested physical responses It is possible to study one s own behaviour in this sense, but the reference is usually to the behaviour study of other individuals

Observation in both spheres is probably as old as human nature One may allow oneself to imagine a caveman both diagnosing his own symptoms of rising ire, and giving precautionary recognition to the flushing cheeks and clenched fists of his rival There would be practical incentive and utility for both types of observation In so far as such observations occur in the course of events as they happen under ordinary conditions, they come under the heading of *casual* or *incidental observation* No doubt mankind has gained much useful and common sense wisdom from this unremitting study, but it could not claim to establish scientific laws, and with the present era came the desire to carry the scientific method of controlled observation and systematic report into both subjective and objective fields of study

When psychological laboratories and statistical treatments were inaugurated in the last quarter of the nineteenth century, no conflict was felt between the two types of research Some purely objective studies were undertaken, on the other hand, it was recognized that some topics were especially, or even exclusively, susceptible to the introspective method So far as possible both methods were combined But with the rise of behaviourism as a school and its rejection of introspection, the range of purely objective research was considerably widened

Scientific observation may, therefore, be divided into three types

(1) The Objective study of Behaviour
(2) The Subjective study of Experience, known as Introspection
(3) The combination of both these, which may in the broad sense of the term be called Psycho-physical study[1]

In the following discussion of these methods, they will be considered not only in their bearing upon the research experiments carried out in psychological laboratories, but also in their application to the educational techniques of mental testing and observation

I THE OBJECTIVE STUDY OF BEHAVIOUR

Objective observation may, in common with other types, be either *quantitative* or *qualitative*, that is, it may be concerned in finding *how much* of a given factor is present in the individual or the group, and in assessing its distribution statistically, or it may be primarily concerned with what *the nature* of the factor is in itself There is, however, no hard and fast line between the two kinds of investigation

(a) *The Natural Scientific Method of Research*

This method is obviously the only one applicable to animals and young children from whom no verbal report is possible Some observations on animals, made within the laboratory,

[1] Cf *The Growth of the Mind* Koffka, p 25

deal with autonomic or organic reflexes, which may be objectively recorded, thus Pavlov[1] could actually count and time the drops of saliva secreted by his dogs during the establishment of the conditioned reflex to the sound of a bell, and Cannon[2] could photograph by X-ray the stomachic disturbances of the cat when constraint in a holder aroused its emotional reactions Other laboratory experiments may deal with somatic reactions such as the maze running of rats, and the escape of Thorndike s[3] cats from puzzle-boxes Observations undertaken under more natural environmental conditions may be no less scientifically conducted, thus Kohler[4] required his apes to make detours to reach food, and to join sticks together to poke bananas into their cage In all these cases the scene is set, the conditions controlled, and the results accurately recorded though not with equally automatic and statistical facility

Human infants, even orphan infants or the offspring of James's desirable 'psychological widower," have had less place in laboratory investigation Dr J B Watson has made use of access to a children's institute[5] to test and time the grasping reflex in the early hours of life, and to discover the original stimuli, for example, of fear reactions, in circumstances where there could be complete control and isolation Of differing aim but no less careful technique was Köhler s test of the infant's choice of the brighter candy box,[6] or Bühler's[7] investigation of the infant's ability to reach a biscuit by pulling the string attached

Numerous objective experiments have been carried out with adults, careful records have been made of individual changes in pulse and respiration accompanying given stimuli, the time taken to react to varying stimuli by depressing a key which records automatically can also be studied without regard to introspective report.

[1] *Conditioned Reflexes* I P Pavlov 1927

[2] *Bodily Changes in Pain Hunger Fear and Rage*, Cannon p 15

[3] *Animal Intelligence* Thorndike.

[4] *The Mentality of Apes*, Köhler

[5] Simply described in *Psychological Care of Infant and Child* 1928 assisted by Rosalie Watson see especially pp 19-20

[6] *Growth of the Mind* Koffka pp 156 157

[7] *The Mental Development of the Child*, K Buhler pp 49-50.

All the examples given above refer to individual reactions, and can yield quantitative results

(b) *Mental Testing*

Of great importance to the practical educator is the testing of *intelligence, performance* and *achievement* The investigation here is rather for the diagnosis of the subject's capacity in relation to an already standardized norm, than for the study of the process itself, that is, it is generally quantitatively rather than qualitatively undertaken The response of the subject must be capable of simple assessment, thus in group tests it may consist of the underlining of the correct answer, of the deletion of the incorrect, and so on

(c) *The Method of Parallel Groups*

A further use of testing is for a comparison of *practice effects* and of the efficacy of *different educational methods* The method of parallel groups, popularized by W H Winch,[1] should prove one of the most fruitful methods for pedagogical research There are two ways of applying it if transfer of training is being measured the subjects themselves are divided into parallel groups, if the effects of two types of training are being compared it is the test material which is so divided Suppose that an investigator set out to examine the influence of arithmetical drills upon efficiency in problem solution Using the first method he would give a standardized test in problems to the whole class, and on the results of it rank the children in order of merit, and then divide them into two parallel groups, A and B, thus

A	B
1	2
4	3
5	6
8	7
9	10

This is a more equitable distribution than that obtained by alternate division as will be found by adding the points Group

[1] E.g *Brit Jour of Psych* II pp 284 293 (1908).

A might then be given daily arithmetical drills for a given time, and Group B left free as a control group or given more problem solution, a final test in problems at the end of the prescribed period should show the respective effects of the interim operations By the second method it would be the problems themselves which, on the result of the preliminary test, were graded into two groups of equal difficulty Group A problems might then be taught or explained by one method, Group B by another, and the results of a final test compared It is, however, not so simple as it may appear to control all the factors and to make sure that the planned variant is the only determining change of influence Either type of investigation depends for its efficacy upon such points as the technical care observed, sufficiently large samples, repetition by the same or different workers under carefully standardized conditions

(d) The Method of Direct Questioning

This method may seem to lead away from the realm of scientific control and computation, for its results are qualitative rather than quantitative It is, however, a method which workers with children especially young children, cannot afford to despise It has been used, for example, to gain a conspectus of the child s stock of concepts at some given stage, such as school entrance age, or to obtain insight into his ideas on some special topic, or to investigate the development of some particular mental process, such as reasoning The method had fallen somewhat into discredit, although analytic workers with delinquent children, such as Healy [1] and Burt,[2] had continued to find it valuable, but it has recently received a new attention and significance from the distinguished use made of it by Professor Jean Piaget and his colleagues at the J J Rousseau Institut at Geneva Piaget has found it best not to stereotype his question series, but to allow a necessary elasticity for adjustment to the child s attunement and response His key questions are drawn from questions actually asked by children of the same age as those questioned Moreover, he has made a careful study of the types of answers

[1] *The Individual Delinquent* Healy 1915
[2] *The Young Delinquent*, Burt 1925 See especially footnote p 416

received, their criteria relative value and safeguards The great stumbling block is the influence of suggestion and of an adult bias In ' The Child s Conception of the World," Piaget investigates the child s notions on such topics as Thought, Dreams, Life, and the Origin of the World To give an example,[1] in the study of dreams his procedure consists of an inquiry bearing on four points in a given order, namely the origin of the dream (' Tell me where the dreams come from ? ") the place of the dream ("While you dream, where is the dream ? "), the organ of the dream (" What do you dream with ? "), and the ' Why ' of the dreams (" Why did you dream of ? "). Another example may be taken from *The Moral Judgment of the Child*, in a study of *Co-operation and the Idea of Justice*, the problem of punishments is dealt with, and the child is asked as an opening " Are the punishments given to children always very fair, or are some fairer than others ? "[2] Whichever way he answers, the psychologist proceeds

> You know, it isn't at all easy to know how to punish children so as to be quite fair Lots of fathers and teachers don't know how to, so I thought I would ask the children themselves, you and your friends I shall tell you all sorts of silly things children have done and you'll tell me how you think they ought to be punished

Then follows the reading of a misdeed committed The child is first asked to invent a punishment, and then to choose the fairest of three read to him, giving his reasons

Every student should make the acquaintance of these books as a study in technique, apart from the content value of their findings, and should make some humble essays with a question series of his own, constructed *mutatis mutandis*

( ) The Method of Direct Observation

Direct observation is a term which may be taken to include the direct questioning described above but it has a wider reference, for it studies not only the directed responses obtained

[1] *The Child s Conception of the World* Piaget, pp. 89-90
The Moral Judgment of the Child Piaget p 199

by questioning, but also the spontaneous reactions, verbal or non verbal The observation may be intensive or extensive, that is, it may be either of an individual or of a number of subjects, either limited to a single topic[1] or extended to a wide range of reaction Thus an intensive individual study may be made of a particular child's use of a certain type of monologue or question, his other responses being disregarded,[2] or this study may be extended to all the children of a group, as when a psychologist sits in a room where children of the given age range enter freely and notes down all the instances of the selected behaviour response occurring over a given period of time, thus Piaget relates how the conversations of some twenty children were noted down from a fixed place in one room and subsequently analysed[4] Studies of complicated processes and of wide ranges of reaction are often confined to one individual child, at any rate in the first instance, even if they are extended later for quantitative verification Miss Margaret Drummond has carried out many of her investigations on a little girl called "Margaret,' who proved a valuable collaborator[5]

Dr Susan Isaacs[6] has recently published reports of some pioneer studies in the social and intellectual reactions of a natural group of children, systematically made and recorded with a wealth of literalism, during three and a quarter years of work at The Malting House School for young children at Cambridge A characteristic of her contribution to method is the fullness of the actual records which she supplies without theoretical interpolations, so that the group activities can be appreciated in their concrete setting A study of the form of these records will help the student to build up a careful distinction between objective observation and subjective interpretation

[1] Cf the interesting technique used by R. Griffiths in *Imagination in Early Childhood* and described in Ch. II of that work. Cf also the account of the Observation of Play given in M Lowenfeld's *Play in Childhood* Ch II

[2] Cf *The First Year of Life* and *From Birth to Maturity* by C. Buhler

[3] Cf *The Language and Thought of the Child* Piaget Ch. V

[4] Op cit. Ch. II, p 50

[5] See *Five Years Old* *The Dawn of Mind* *The Psychology and Teaching of Number* Margaret Drummond

[6] *Intellectual Growth in Young Children*; *Social Development in Young Children*, Susan Isaacs.

A few examples may be given in illustration

24 2 25[1] Tommy (2, 11) brought his mouth-organ to school and Dan (3, 8) suggested, 'Shall all the boys take turns to use it? shall we be a band and I'll go first?' He then tried to take the mouth-organ from Tommy 'Oh, *give* it me,' he said '*I m* going first, we're going to be a band (from section Primary Egocentric Attitudes in Social Play)

'18 3 25 Martin (3, 0) came dressed in a sailor suit with long trousers, which interested the others greatly, they laughed at him Tommy (3, 0) said he was 'a sailor, the others said he was a silly sailor,' and they showed some hostility for a little time, Dan (3, 9) and Frank (5, 4) saying, Shall we hit him?' ' (from section Group Hostility to Strangers and Newcomers)

19-5-25[2] Harold (5, 4) fell down and hurt his knee Duncan (7, 1) said at once, Shall I bathe it for you? because you bathed mine yesterday They went in together and spent some time bathing the wound' (from section Friendliness and Co-operation)

Burt, in discussing the reports of voluntary helpers who would, for instance, take his cases to the Zoo or the Park, to assist with observation under more natural conditions, writes

> It is imperative, however, that these observers should describe concrete facts and actual behaviour, and not merely their speculative inferences, couched in popular or pseudo scientific terms to know that Harold went off with the nuts intended for the monkeys, and that Lizzie pushed her little sister in the pond, is far more enlightening than to be told (I quote one observer s account of these two incidents), the boy seemed a plain case of kleptomania, and the girl almost homicidal' [4]

(*f*) *The Rating Method*

The attempt is often made to submit the qualitative methods discussed above to a quantitative *rating* on some scale of points,

[1] Op cit p 31 The ages are given for 1 10-24 only complete subsequent calendar months have been added.

[2] Op cit p 74 [3] Op cit p 101

[4] *The Young Delinquent* Burt p 418

in order to check up subjective impression by a numerical code which can be used comparatively Thus individuals may be rated on a scale of points (e g 5 or 10) for a selected list of traits It is likely that this method will achieve a useful development, the chief drawback at present is that no completely satisfactory lists of traits free from overlap have been evolved [1]

Webb [2] used this method for the investigation which led him to the discovery of the general determinant *w* (or will) His principal subjects were 200 students of an average age of 21 years, and these were divided into groups of 20, and each group was kept under the continual observation of two responsible fellow students for several months These observers were given a schedule of traits, and working independently of one another, assessed each subject for each trait on a scale between 3 and — 3, the subjects themselves being kept in complete ignorance of the investigation

(g) *The Biographical Method*

Continuous extensive studies of individuals are usually of infants attempts are sometimes made to record the whole gamut of reactions from the moment of birth, in chronological order of appearance The conditions are uncontrolled, but the scientific claim lies in the careful technique of the observation and recording, from this point of view the method has the same claim to scientific consideration as has that of the field botanist who systematically charts the dates of the flowering of chosen plants, or of the ornithologist who records the mating and migration of birds over whose movements he can exercise no control

Stern [3] gives some useful advice for anyone about to practise this method setting out recommendations for indexing, dating, recording age (in years and months, e g 9, 7, for 9 years and 7 months) and supplementing reports by facts concerning the constitution, heredity and environment of the child

[1] See p 94 above

[2] Quoted *Abilities of Man* Spearman pp 345 346 See also *The Young Delinquent* Burt pp 416-417

[3] *The Psychology of Early Childhood* Stern p 42

Some notable studies[1] on these lines have been made in Germany by Preyer, Sully, Stumpf, Charlotte and Karl Bühler, and Clara and William Stern, in America Miss M W Shinn's *Biography of a Baby*, a record of her niece, remains a model of this kind of study

(*h*) *The Clinical Method*

Child guidance and psycho-educational clinics aim at securing as complete a picture as possible of the physique and personality of the individual child, they thus make use of most of the methods described above.

A good summary of the pre-requisites of a psychological clinic is given by Dr Cyril Burt in an appendix to the *Young Delinquent*[2] The staff should consist of at least two psychologists, one a man and the other a woman, having between them expert knowledge of analytical methods, of routine testing, and, if there is no physician on the staff, of medical practice, at least one social worker is desirable for home visiting, vocational advice and so on, and a shorthand typist is necessary for accurate recording and filing, waiting and consulting rooms and an office are required, as well as a properly equipped laboratory The child can then be systematically examined by means of physical measurements, intelligence tests (both verbal and performance), scholastic and achievement tests, tests for special abilities (such as memory, manual dexterity), temperament tests, vocational tests, and direct questioning by whatever set of more or less stereotyped questions the psychologist finds useful[3]

Some child-analysts adopt a method by which the child acts out his responses in play with the analyst instead of giving merely verbal responses, and so reveals his phantasies in a form more consonant with his stage of development[4] Often there is a *play-centre* attached to the clinic so that a psychologist can study the child's spontaneous reactions to other children under natural conditions

[1] The best known in English versions are *Studies of Childhood* Sully *Psychology of Early Childhood* Stern *The Infant Mind* Preyer

[2] *The Young Delinquent* Burt Appendix II p 617

[3] Op cit see footnote to p 416

[4] See for example the account of this technique given by Dr Susan Isaac in *Social Development in Young Children* pp 408 ff.

Many such clinics and centres exist in London and in the large industrial towns of England and the United States An interesting account of this clinical development in America has recently been published, showing that 232 such clinics had been established by 1932 [1]

In sparsely populated countries like South Africa, it is more difficult to provide for the relatively small numbers which re present the usual percentage of exceptional cases of maladjustment. Beginnings have to be made with part time clinics, the staff of which give certain hours from university duties or medical and psychiatrical practice Such a clinic has existed at Bloemfontein since 1927 [2] " under the auspices of the Orange Free State Teachers' Association and the O F S Mental Hygiene Society, in co-operation for research purposes with the education department of the University College of the Orange Free State A beginning has also been made at Cape Town as the following extract from the departmental gazette explains [3]

' A Child Guidance Clinic, conducted by Professor Strasheim under the ægis of the University of Stellenbosch and supported by this Department, has been in existence at Salt River since 1931 The clinic has recently been extended, and is now under the joint management of Professor Strasheim of the University of Stellenbosch and Professor Reyburn of the University of Cape Town, in premises owned by the A C.V V [4] at Salt River It is being conducted in co-operation with this Department, the Department of Psychology of the University of Cape Town the Departments of Sociology and Educational Psychology of the University of Stellenbosch, a psychiatrist and a lady doctor, for the purpose of giving free advice to parents and teachers, especially with regard to 'problem' or difficult' children

[1] A Quarter Century of Development by G S Stevenson and Geddes Smith reviewed *Brit J Ed Psych* Vol. IV Pt 3 Nov 1934

[2] Paper read before the British Association for the Advancement of Science at Johannesburg 1929 Reported in *The Teacher* 31st July, 1929

[3] *Education Gazette* 7th Feb 1935

[4] A Women s Christian Association for social welfare work.

"Persons wishing to avail themselves of the services of th. clinic should communicate with Professor Strasheim or Professor Reyburn The services of the clinic will also be placed at the disposal of schools in districts adjoining Cape Town"

The day cannot be far distant when every education authority must make at least as adequate provision for mental as for medical inspection and treatment, and must recognize both expenditures as of the greatest importance in the national economy

This rapid survey of objective methods covers a wide range of pure and applied psychology, and presents a stimulating picture Yet it cannot be fully appreciated in isolation from the contribution of the subjective methods

II THE SUBJECTIVE OR INTROSPECTIVE STUDY OF EXPERIENCE

The antithesis between objective and subjective methods is actually less sharp than it is sometimes made to appear[1] The objective observer still relies upon his own personal observations whether of human reaction or of mechanical measurement, he trusts his subjective impressions of sight and sound in the same way as the physicist does On the other hand, the introspectionist spares no pains to control and refine the conditions under which his impressions are stimulated and recorded

Nothing can ever supersede the importance of the psychologist s personal introspections for the suggestion of hypotheses, these will generally spring first from incidental observations, but they afford theories for systematic examination In the old days of arm-chair psychology, such theories were apt to pass straight into *a priori* judgements, now they must be subjected to searching experimentation or verification from other quarters before they can find scientific acceptance. Often they become starting points for further unexpected discoveries.

There are some problems which can never be amenable to any method other than pure introspection, if their solution is possible at all. Of such a nature is the question whether

[1] Cf. *Contemporary Schools of Psychology* Woodworth Ch. II, for discussion of this point.

imageless thought does or does not exist, and the question whether sensation can or cannot be experienced apart from perception

The beginner in psychology must rid himself of the popular contempt for introspection which associates it with "morbidity" and regards it as confined to questions of motivation A great deal of psychological introspection is concerned with 'facts" which seem to him no less objective than do the statements, "I hear a train," I intend to go' The experimenter is calling for introspection when he presents stimuli and asks the subject to tell him whether he sees red whether he sees a green after-image, which of two reds he prefers, and so on

Numerous objections are commonly advanced against introspection and call for such safeguards as are possible

1 Experience is in a state of perpetual flux and is therefore too transitory for anything but *retrospection*, which is subject to all the weaknesses of memory imperfection This is partly true, though means of immediate registration are sometimes possible under experimental conditions 2 Mental phenomena are said to be too complex for the attention to span, but repetition of experience allows for deliberate adjustments of attention to separate aspects on different occasions 3 The natural bias of the mind is towards an objective reference for experience, it is for example more natural to record the fact ' it is raining,' than the fact that ' I experience certain auditory sensations of a sharp pinging sound, cutaneous sensations of coldness, moisture and uneven pressure" This difficulty can only be overcome by systematic practice and discipline 4 For this reason the objection that the psychologist is biassed, finds what he expects, and interprets according to the fallacy of his own inference, is not always to be overcome by the use of naive and untrained subjects who do not know what to expect. This may be a useful check, but in the most subtle processes the subject himself must be a trained introspectionist. 5 The difficulty of securing language equivalences in the recording and reporting of results is another objection, but every science has had to wrestle for a standard terminology and it is not impossible that a rich and flexible language should be made almost as adequate and precise for subjective as for objective

[illegible] in order for [illegible]

[illegible] the very act of introspecting [illegible] [illegible] the course of the [illegible] [illegible] energy becomes drawn off to this [illegible] [illegible], and becomes by so much the less available for [illegible]

[illegible] should be scope for valuable psychological research [illegible] [illegible] if psychologists were allowed to record the [illegible] of those who have undergone [illegible] [illegible] in traffic accidents.

An [illegible] which has had much vogue [illegible] [illegible]. This must not be confused [illegible] The [illegible]

[illegible]

III THE COMBINED METHOD OF SUBJECTIVE-OBJECTIVE, OR PSYCHO-PHYSICAL OBSERVATION

Observation of experience and of behaviour may combine in varying proportions

Some experiments may be essentially objective, yet the subject's introspective report may be required as accessory data which may throw light upon irregularities in the external reaction It is a golden rule, wrote C S Myers [1] in 1911, ' that introspection should never be omitted in a psychological experiment.' Thus reaction time must be objectively recorded and the experiment can end there , but the results will be checked and enriched by an introspective analysis of the differing mental attitudes which accompany muscular or sensorial, simple or choice reaction Similarly, the rote learning of nonsense syllables gave Ebbinghaus his Curve of Obliviscence " by a purely objective method , but subsequent introspections have illuminated the mental devices for supplying rhythm, meaning and association even in nonsense syllables, and have prevented a too rigid segregation of rote from logical learning

Other experiments are essentially introspective, but can be more accurately recorded by a direct physical reaction or the use of a verbal formula, than by verbal description Thus the subject may give notice of the duration of after-images by the depression of an electric key or the pressure of a bulb He may be asked to arrange weights in a certain order, or to report ' lighter—same—heavier ' in the comparison of a number of weights with a fixed standard Such psycho-physical methods have given much information about the process of perception and the thresholds of stimuli which produce sensation or differences of sensation

The methods of psychology have been somewhat fully treated in the hope that the student, even if his education course does not allow time for research experiments in a laboratory, may essay such methods of observation as are accessible to him, and may resolve to adopt some at least for his subsequent work in the classroom

[1] *Text-book of Experimental Psychology* C. S Myers

THE GENERAL FUNCTION OF PSYCHOLOGICAL EXPERIMENT[1]

It will have been obvious in the above study of methods that experimental procedure plays a dominant part both in the qualitative study of mental processes, and in the quantitative measurements of their distribution No study can claim to be a science which is not amenable to control of conditions and exact measurement of results

1 One of the main purposes of control is to bring about *isolation*, whether of the stimulus, of the mental aspect to be studied, or of the response. There is, for example, isolation of stimulus when the subject is put into a darkroom for the reception of a visual stimulus, or into a sound proof room for the reception of an auditory stimulus, thus insuring against the competition of irrelevant stimuli The field of investigation may be limited by the instructions given, as when the subject is instructed to ignore the *colour* of an after image and report upon its *duration*, or vice versa The response itself is usually restricted by the apparatus and the instructions, and all irrelevances ignored, in an experiment on muscular fatigue, for example arm and hand are restricted and only the finger required for weight lifting left free

2 A second important point is that *standardization* makes possible the *repetition* of an experiment under the same conditions by the same or other experimenters, for the comparison and checking of results

3 Further the results become susceptible to *accurate recording and measurement*, often by means of complex apparatus electrically driven Such apparatus needs to be carefully understood and manipulated by the experimenter if aberrations are not to occur The results may, for example, be tracings on the smoked surface of a revolving drum, or the recordings of a chronometer which registers in thousandths of a second Such data can subsequently be dealt with by various *statistical* methods. It is, however, well to remember that no amount of statistics can give value to figures which are based on inadequate data or are carelessly obtained

[1] See *Text-book of Experimental Psychology* Myers, Pt. 1 *Manual of Mental and Physical Tests*, Whipple Pt. 1

CHAPTER XVII

PRACTICAL WORK FOR EDUCATION STUDENTS

THE PLACE OF EXPERIMENT IN THE STUDY OF EDUCATIONAL PSYCHOLOGY

ONE of the anomalies of psychology has been the way in which experimental and general psychology have been upon separate and even divergent lines so that they hardly appeared to be aspects of one and the self same subject The ' academic " text books for students of education, having been but lately emancipated from their subordination to philosophy, have until recently lagged far behind the contemporary level of experimental research, and have incurred the reproach of being arm-chair " psychologies based on *a priori* opinions But within the last decade a great change has come over the text-books, many of those in current use are packed with experimental findings, tabulated data and so forth The danger now is that students may make an " arm-chair ' use of these books If initiative and reasonable facility for further child study and investigation of educational method are to be part of the equipment of the rank and file of teachers, primary or secondary, students must be less concerned with learning to answer examination questions in psychology and more concerned with mastering the practical techniques for systematic observation and testing The lecture must be supplemented by practical work in as many forms as possible

The suggestions and provision for practical work contained in the present text book are summarized below

1 *Recorded Observations* —It is suggested that students should begin their study of psychology by observing in school playground or play-centre (*a*) some selected reaction types of at

least one individual child, (*b*) the manifestations of a particular type of behaviour throughout a group of children, carried out over a given time Later it would be well if they could draw up and carry out a small investigation by a special method, such as the rating, questionnaire, or direct questioning method, in relation to some selected topic for theoretical study

2 *Experimental Observation*—(*a*) *Class experiments*, in which the lecturer acts as experimenter, are provided on such topics as reaction time, fidelity of report, the mental work curve, trial and error learning, rote and logical memory, and transfer of training (*b*) *Individual experiments*, such as those given on attention and perception, are intended to be undertaken by pairs of students working alternately as subject and experimenter, in order that some experience may be gained of the precautions required in conducting a test (*c*) Each pair or group of students is then recommended to choose some particular line to work upon privately for more extended study, for example, a curve of obliviscence might be obtained from a serial experiment with nonsense syllables, or a little investigation on transfer of training effects might be planned and undertaken during teaching practice An opportunity should be given for some at least to become acquainted with the technique of individual or group intelligence testing so that some fluency could be acquired and a sufficient knowledge of the sources of information and the necessary precautions, in this way students would at least know how to perfect themselves later, should practical occasion arise The ideal would be the selection of topics for investigation by the students themselves around a ' centre of interest which would give coherence to a co-operative result Such a procedure would limit the range of each student s personal practice but would give him a clue for further working along lines which others had followed, references for which would be accessible Projects of this kind offer boundless possibilities especially if ex-students could be encouraged to report their findings when in active service, for synthetic treatment at the college

(a) HOW TO WRITE UP AN EXPERIMENT

Some detailed directions on how to write up group and individual experiments may be found of practical use Rough jottings must be made at the time of the experiment which should later be written up into a separate note book or file on some such plan as the following

(1) *The Name of the Experiment*—This generally includes a *general heading* and a *sub-heading*, as, for example, 'Reaction Time Muscular reaction to touch stimulus, or Mental Work Curve Continuous addition'

(2) *The Time and Date of the Experiment*—Both these points are important, for the interval between trials may be a significant factor, as may be the time of day because of fatigue effects

(3) *The Name of the Subject*—When a student is writing up a class experiment in which he has taken part, he should enter (*a*) his own name, and (*b*) the number and designation of the group In individual experiments it is the experimenter (E) who writes up the record of the performance of his subject (S)

(4) *The Aim of the Experiment*—It is of the utmost importance to state clearly the *problem to be studied*, which often falls into several sub-divisions E must always know his aim beforehand, in some experiments S must not know it until afterwards (as, for instance, in a *suggestion* experiment)

(5) *Apparatus and Material*—This should be briefly enumerated, but should not anticipate the instructions which belong to the next heading

(6) *Method or Procedure*—This must be sufficiently detailed for the repetition and checking of the experiment by another E It should include the exact directions given to the S, as slight variations in these may have widespread effects upon results It is often desirable to allow a few preliminary trials to give S confidence that he has grasped the requirements, but this should be omitted where practice effects would compromise the experiment

(7) *Treatment of Results*—Under this heading should be specified any statistical treatment involved, such as averaging percentaging, graphing, correlating (for which directions and formulæ are given below)

N.B—All the information specified so far will have been known to E before the performance of the experiment

(8) *Results*—Nothing reveals the mental order of a student so much as his setting out of results Wherever possible they should be tabulated, and they should be labelled with a clarity and inclusiveness which does not require reference to a key given earlier In class experiments a double result will usually appear (*a*) individual, (*b*) group Actual test-sheets (for example, of continuous addition or of mirror-drawing) should be pasted in, and graphic representations of learning curves, etc (individual and group), should be neatly labelled and mounted

(9) *Objective Observations*—These are normally made by E, but in group experiments S will record them, they include notes of any interruptions, untoward procedure, or variations in S's behaviour (as observed by E, or by S of his fellows)

(10) *Introspective Observations*—In individual experiments S will either dictate these or write them down for E In group experiments each S will record his own Such observations will often account for some vagary in results S may have a headache, have just received bad news, have let his attention wander at some point have misunderstood directions, been spurred to emulation of his neighbours, become fatigued, and so on He will normally record his affective attitude towards the experiment He will also try to examine the cognitive processes at work during the operation This drill in introspection supplies no small part of the value of such test exercises to the student He seldom requires much incitement to it.

(11) *Conclusion*—It is useful to distinguish between (*a*) *Particular Conclusion*, which may fall under the headings (i) Individual and (ii) Group, but in either case refers to the actual concrete results of the experiment in hand, often involving reference to the actual figures of the result (*b*) *General Conclusion*, which is possible when some general psychological law has been demonstrated, it must not, of course, conflict with the particular conclusion nor exceed its findings, if these have been unsatisfactory or inconclusive, *no* general conclusion can be drawn from them It is surprising how often students will take meticulous pains to write up an experiment involving much

transcription of procedure, results, etc, and throw away a great part of its value by the scanty attention given to the conclusion The results must be examined in the light of the *aim*, though they will sometimes yield points over and beyond, they must be squeezed dry of all that they hold, often in form of a serial enumeration, substantiated point by point To dash off the conclusion given in some text book in a vague, casual way is, of course, worse than useless Truthfulness is the pre requisite of science, and if the experiment has failed to give a result of any significance, it only remains to say so, or to repeat the experiment to see whether the fault has lain in the procedure

(*b*) SOME STATISTICAL TERMS AND METHODS

In all matters of distribution of marks and scores whether for the ordinary classroom marks, for the results of mental testing, or for the results of experiments, certain measurements will be found of use

The teacher is usually content with *percentages* and with the *average* or *mean* But the *mean* tells nothing about the *range* or scatter of the marks

The *median*, or middle score of the list, is also of use, especially if the top and bottom scores are known

The *mode*, or score which occurs most often, may be a guide, but has no real mathematical value

A quick way of finding the scatter is to find the *median* of the whole series, and then the median of each of its halves, this divides the series into four equal parts The value one-quarter up from the median is called the *upper quartile*, the value one quarter down from it is the *lower quartile*, the difference in value between the upper and lower quartiles is known as the *interquartile range*, often it is halved and the result given as the *semi interquartile range* (or quartile deviation) These five measures, the lowest, the lower quartile, the median, the upper quartile and the highest, can give a rough and easily obtained mental picture of the curve which any set of scores or marks will follow

To make this plain three sets of actual marks of parallel divisions in a half yearly test are given below

N.B—All the information specified so far will have been known to E before the performance of the experiment

(8) *Results*—Nothing reveals the mental order of a student so much as his setting out of results Wherever possible they should be tabulated, and they should be labelled with a clarity and inclusiveness which does not require reference to a key given earlier In class experiments a double result will usually appear (*a*) individual, (*b*) group Actual test-sheets (for example, of continuous addition or of mirror-drawing) should be pasted in, and graphic representations of learning curves, etc (individual and group), should be neatly labelled and mounted

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transcription of procedure, results, etc , and throw away a great part of its value by the scanty attention given to the conclusion The results must be examined in the light of the *aim*, though they will sometimes yield points over and beyond, they must be squeezed dry of all that they hold, often in form of a serial enumeration, substantiated point by point To dash off the conclusion given in some text-book in a vague, casual way is, of course, worse than useless Truthfulness is the pre requisite of science, and if the experiment has failed to give a result of any significance, it only remains to say so, or to repeat the experiment to see whether the fault has lain in the procedure

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To make this plain three sets of actual marks of parallel divisions in a half yearly test are given below

	X (21 *Subjects*)		*Y* (23 *Subjects*)		*Z* (22 *Subjects*)	
1	80		80		80	
2	71		80		71	
3	69		70		69	
4	69		65		67	
5	65		63		58	
		Upper Quartile				
6	65		62	Upper Quartile	56	Upper Quartile
7	61		58		53	
8	61		55		53	
9	60		55		52	
10	60	S I R.	54		51	
11	58	Median; S I R. 21/2	5-	S I R.	51	Median; S I R. 18/2
12	57		52	Median; 19/2	45	48
13	48		51		45	
14	48		51		43	
15	46		51		39	
16	44		45		39	
		Lower Quartil				
17	42	43	44		38	Lower Quartile
18	39		43	Lower Quartile	38	
19	31		42		36	
20	29		38		33	
21	22		38		32	
22			36		26	
23			30			

	X	Y	Z
Mean	53 1	52 8	48 9
Mode		51	
Median	58	5	48
Highest Mark	80	80	80
Upper Quartile	65	62	56
Lower Quartile	43	43	38
Lowest Mark	-2	30	26
Semi Interquartile Range	10 5	9·5	9

In order to test these measures on a larger series, it will be useful to put the whole list together and see how they work out

For 66 subjects	
Mean Score	51 6
Mode	51
Highest Score	80
Upper Quartile	61
Median	51 5
Lower Quartile	42
Lowest Score	22
Semi Interquartile Range	9 5

It remains to see how these figures would plot out graphically It would take a long time to plot 66 separate points, so that it is usual for approximate purposes to plot in tens, which gives a histogram, or frequency-column graph

Our table would stand thus

80	per cent.	and over	4	cases
70	„	,	3	
60		,	13	
50		„	18	
40	,		12	,
30	,	,	13	,
20		,	3	„

The percentages are plotted along the horizontal axis, the frequencies along the vertical axis

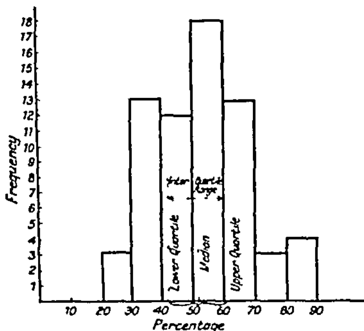


FIG 38 —Frequency-column graph for set of marks

Before criticizing this curve, we must examine the ideal distribution which should be obtained if a large enough (or infinite) number of cases were taken Expressed as a frequency curve it gives a bell shaped curve known as the *Curve of Normal Distribution*

Such a curve is not necessarily built up upon a 100 point scale—any measurement may be represented along the horizontal axis [1] It stands for the following facts

1 Most of the cases cluster around the central value
2 Large deviations from the mean occur less often than small deviations
3 Deviations of a given magnitude are equally likely to occur in either direction from the centre

It will be a good exercise to criticize the set of marks given above Note that for the 66 subjects the Median, Mean and Interquartile ranges are very satisfactory, and so are the extremes But there is evident (*a*) a teacher's tendency to tip the best candidates into the A grade on the bare minimum, hence an

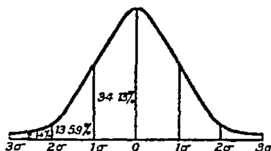


FIG 39—Curve of normal distribution.

unnatural bunching on the 80 per cen mark, (*b*) an undue preponderance of 30 per cent. marks, which would call for attention

The student should be able to compare the characteristics of the three divisions for himself

It has to be remembered that the ideal distribution will seldom be achieved in practice, and that the fewer the number of cases the less likely is it to be obtained In some tests indeed it would not be desirable Suppose that a simple test of ten to twenty

[1] The line joining O to the summit measures the mean, median and mode in normal distribution. The curve on either side would only meet the axis at infinity It is only shown as far as $\pm 3\sigma$ Over 68 per cent. of all the measures fall within the curve between -1σ and $+1\sigma$ over 95 per cent between -2σ and $+2\sigma$ and 99·73 per cent. between -3σ and $+3\sigma$ (Standard deviation σ is explained below)

prepared spelling words were given to a class, a teacher could reasonably expect a skew-curve to the positive side (1), but if the test were an unseen one in general knowledge, it might easily be skewed in the negative direction (2)



(1) (2)

Fig 40—Skewed curves

For scientific purposes a more reliable measure of the deviation from the central tendency is required, and this is found in the *standard deviation* (abbreviated either to S.D or the Greek letter σ, *sigma*) First the *mean* is found, then the variation of each term from the mean, positive or negative, these deviations (d) are then squared, so that they all become positive (d^2), next they are added (Σ) and divided by the number (n) to find their mean, and the square root of this is found In this way due weight is given to the significance of the greater deviations, which are magnified by the squaring The formula runs

$$\sigma = \sqrt{\Sigma(d^2)/n}$$

There are two methods of finding the *Coefficient of Correlation*, or the measure of correspondence between two variables The longer method involves the use of the standard deviation The second or *Ranking Method* (by Spearman's Foot rule) will be found convenient for class scores and marks It is demonstrated below for a comparison of the performances of 20 students (arranged alphabetically) in (*a*) the examination in academic and practical subjects held at the end of a first year training-course, and (*b*) a group intelligence test The method is as follows

1 Rank all the candidates in order for both performances
2 Subtract each one's order in the intelligence test from the order in the examination, putting + or − signs accordingly, the sum of these gains and losses should exactly balance

3 Having found the sum of the gains (Σg), work out the correlation coefficient (r) by the following formula, where $n =$ the number of candidates

$$r = 1 - 6\Sigma g/(n^2 - 1)$$

Subjects in Alphabetical Order	Rank in Examination (a)	Rank in Intelligence Test (b)	Gains.	Losses.
A	4	5		− 1
B	20	20		
C	11	9	2	
D	7	7		
E	5	3	2	
F	12	13		− 1
G	17	18		− 1
H	1	1		
I	16	19		− 3
J	15	16		− 1
K	14	7	7	
L	13	16		− 3
M	2	10		− 8
N	18	16	2	
O	19	14	5	
P	8	4	4	
Q	6	11·5		− 5·5
R	3	2	1	
S	9	7	2	
T	10	11·5		− 1·5
		Totals	25	− 25

$$r = 1 - \frac{(6 \times 25)}{400 - 1},$$

$$r = 1 - \frac{150}{399},$$

$$r = 1 - 38,$$

$$r = \cdot 62$$

The two scores therefore show a positive correlation Perfect correlation (not allowing for "probable error") would be unity,

perfect inverse correlation would be -1, a zero result would mean that there was no correlation

Useful, and possibly enlightening, exercises may be had in finding correlation coefficients by taking any sets of pupils marks in two different subjects, allied or diverse, and seeing whether they show any positive correlation Small values, either plus or minus, have no significance, as allowance has always to be made for the *probable error* due to the chances which occur in selection and procedure, and this becomes larger as the number of cases becomes smaller For further particulars a manual of experimental work must be consulted

Discussion of statistical terms and methods will be found in the following books, amongst many others

Mental Tests, Ballard
The Objective or New Type Examination, Ruch
Introduction to Experimental Psychology, Valentine
Text-book of Experimental Psychology, Pt 1, Myers
Manual of Mental and Physical Tests, Pt. 1, Whipple
Experimental Psychology, Collins and Drever (especially Appendix B)
Practical Psychology, Charles Fox
Introduction to Theory and Practice of Psychology, Ll Wynn Jones

CHAPTER XVIII

PRACTICAL EXERCISES

LIST of *Practical Exercises* with reference to Chapters with which they correspond

Experiment	1	Reaction Time	Ch II
"	2	Intelligence Testing (*a*) Individual (*b*) Group	Ch X
"	3	After Images	Ch XI
"	4	Types of Imagery	
"	5	Span of Apprehension	
"	6	Division of Attention	
"	7	Attention and Perception Fluctuation and Control.	
"	8	Trial and Error Learning Mirror Drawing	Ch XII
"	9	Mental Work (or Fatigue) Curve Continuous Addition	Ch XIII
"	10	Transfer of Training Cancellation	
"	11	Memory (1) (*a*) Methods of Rote Learning (*b*) Rote and Logical Learning	Ch XIV
"	12	Memory (2) Whole and Part Learning	
"	13	Fidelity of Report	Ch IV or XIV
"	14	Formation of Concepts	Ch XV

NOTE ON APPARATUS REQUIRED

Practically no special apparatus is required for the experiments given A stop-watch is essential, and several are desirable

Mirror drawing apparatus, which has a small mirror hinged to stand perpendicular to a horizontal board, is convenient but not essential, a number of cheap mirrors can easily be mounted by any carpenter

A *tachistoscope* is a great advantage, a simple hand-worked contrivance suffices, it is only necessary for a shutter containing an aperture to fall past another aperture in the front of the tachistoscope, so that there is an instantaneous exposure of the card placed in a slot behind

Other requirements can be met from the ordinary stationery resources, so long as some duplicating apparatus is available

EXPERIMENT 1[1]

REACTION TIME TO TOUCH STIMULUS

Aim—To find the length of Simple Reaction Time (Natural, Muscular and Sensorial) and Choice R T to touch stimulus

Material—Stop-watch

Procedure—(The writer, after much fruitless time and labour in trying to deal with apparatus experiments with large numbers, eventually found the following simple device, first recommended by Sir Francis Galton, and described in *Experimental Psychology*, Collins and Drever, pp 157 164, and elsewhere, far more satisfactory for the purpose, and productive of quite indicative results) Arrange S s in close circles of 10 (the competition of two such circles provides useful incentive), each S lays his right hand (further experiments can be done with the left if desired) on the R. shoulder of the S in front One S holds the watch and after a warning signal given 1 or 2 seconds in advance, simultaneously starts the watch and presses the shoulder of the S in front of him The pressure is passed round until it returns to the originator who stops the watch Let S s practise a little before each new reaction. Instruct them to be alert and to keep eyes shut Then record 10 readings of each of the following —

(*a*) *Natural reaction*—Each S reacts as comes naturally to him

[1] The instructions pp 329-331 must be studied beforehand

(*b*) *Muscular reaction*—S's are instructed to attend to their reaction—to have it ready to be set off like a 'hair trigger'

(*c*) *Sensorial reaction*—S's are instructed to concentrate on the reception of the stimulus and react as it is apprehended

(*d*) *Choice reaction*—(i) S s put both hands on shoulders The starter decides upon which hand he will use and each S must pass on the pressure with the same hand

(*e*) *Choice reaction*—(ii) As above, except that S's react with the opposite hand from the shoulder receiving the stimulus pressure

Treatment of Results—Each reaction time should be recorded and the 10 reaction times added, they must then be divided by 10 to get the time for one individual, and by 10 again to find average individual time for one reaction, by thus moving the decimal point two places, the result stands as thousandths of a second, or σ, which is the accepted unit for such measurements

Practice reduces R T and a second set of trials often shows improvement

Results—The following table of results was obtained by one group of 10 S's using this simple method

AVERAGE R.T TO TOUCH STIMULUS FOR 10 TRIALS OF 10 SUBJECTS

Simple R.T	*a*	Natural	153σ
	b	Muscular	111σ
	c	Sensorial	131σ
Choice R.T	*d*	Same hand	224σ
	e	Opposite hand	354σ

Remarks—Probably S s were not concentrating fully on the stimulus in Sensorial Reaction as the time is suspiciously low Usually this is slower, but more reliable Muscular is quickest but apt to fire off before time, and to be less steady in time Natural R.T, which may involve either sensorial or muscular, is usually mid way between the two Muscular R T to a touch stimulus is the shortest, all other sensory stimuli giving longer muscular R.T s

References—For further discussion of the significance of this experiment see Myers *Text-book of Experimental Psychology*

EXPERIMENT 2

(a) INDIVIDUAL INTELLIGENCE TESTING

The instructions given below are such as would apply to the giving of any scale based upon the Binet Simon tests, they will however, be more specifically related to the '*Official Mental Hygiene Individual Scale*' (*Mental A 42, Amended* 1927), of the Union of South Africa

Particulars of the Scale

It follows the *Stanford Revision* of the Binet scale by Terman fairly closely, though there are some age changes also some Knox Cube tests are included, and the Healy Fernald form board This test is used in the Mental Hospitals and for official grading purposes, it is standardized in English and Afrikaans Copies and apparatus can be obtained from Pretoria It is necessary to have the full *Instructions for Marking* a thirteen page leaflet, as well as the printed schedule (a folded foolscap sheet with the questions in summary form) required for each testee s record A good deal of the apparatus is such as can be assembled at short notice, stamps, current coins, a key, hat, etc, other things, such as the form board, the pictures of ugly and pretty faces, colours, figures [1] and the pictures for interpretation (which are those used by Terman), must be obtained in the official form

Preparation and Practice

The tests should be thoroughly studied first and worked through by oneself, with constant reference to the fuller directions in Terman s *Measurement of Intelligence* or Burt s *Mental and Scholastic Tests* It should then be worked through on several fellow students, after which a number of children of different ages should be tested, with constant reference to the procedure and with comparison of results with the specimens of marking given in Terman and Burt Any teacher should be able to give the tests if he is prepared to make some twenty to thirty practice applications in this way

[1] These are the same as the original Binet Simon material reproduced in *Mental and Scholastic Tests* Burt

It is not expected that the student who selects this line of study *will be able to give more than six to ten trials*, these will be of use if they serve to show him what more is required before he can presume to apply the tests for diagnostic purposes It would be well if he could also observe a few applications by an experienced tester

Actual Procedure—It is generally best to be alone *with* the child to be tested, who should be comfortably seated at a table or desk of the right height opposite to the examiner It is important to establish good *rapport*, the tester's manner should be friendly and stimulating The child should not be kept waiting about beforehand or be given any sense of impending ordeal, to a small child (and 3 year-olds are not always easy to settle down) it should seem like a game It is well not to touch the child, or to look fixedly at him The examiner must know his part so word perfectly that it sounds like a natural (not parrot like) conversation, one question following readily on from another, test materials should be out of view (e.g in a case by the examiner s side) until required, and should be readily accessible in the right order, without delay or fumbling Experience of beginners and the teaching habit," which renders the proceedings excessively tedious, would lead the writer to an emphatic endorsement of Burt's warning '*During a test neither teach nor criticize* These are the two lapses to which, by sheer force of professional habit, the teacher most inclines Criticism diminishes candour and destroys self-confidence Instruction transforms the examinee s entire attitude toward the remainder of the tests, and by prolonging the interview, exhausts his attention and depletes his interest before the test-series is concluded Accordingly, so long as the child is doing his best, greet every response as if entirely satisfactory Give no hint before he answers, *no clue as to his correctness when he has replied*' [1]

The exact directions of the tests must be scrupulously followed as to time and number of repetitions allowed, etc. The original idea was that the child should be taken back to the age-group in which he could get all the tests right, and forward to that in which he could get none right, and this should be more or less adhered to, Binet advised examiners in practice 'to begin with tests suited to the child's true age to work backward, if necessary, until he succeeds with at least five consecutive tests, and then to work forward until he fails with at least a further consecutive

[1] *Mental and Scholastic Tests* p 15 (italics are the writer's)

five "[1] Burt advises that "every child should be given, if time permits, tests for at least four consecutive age groups "[2] This will take from 30 to 40 minutes, though no child under 7 should be tested for more than half an-hour at a sitting In actual practice it is often difficult to run a child out, as he may be in advance in one type of test and far behind his age in another, for example, in testing orphanage children, the writer found that the youngest children could tie the bow knot put down for the 7 year-olds, because they were in the habit of tying the strings on their pillow-cases, whilst they were far behind in recognition of coins, with which they had no practical dealing

Where possible (and especially if doubtful, peculiar absurd) the exact answers should be recorded, the schedules allow room for this, a typical, correct answer can be merely ticked The small sheet with the child s drawings or writing, etc., should be enclosed in the schedule To this may be affixed any special observations, e g of the child s general response, unevenness of performance, or these may be entered in a separate note-book

Computation of results once marked is a simple matter as a key for converting number of tests passed into Mental Age " is given on the back of the schedule

(b) GROUP INTELLIGENCE TESTING

Every teacher should feel competent to give a group test of intelligence, although the same precautions are necessary as for individual testing, and no scores can be considered comparable with published norms unless the directions have been meticulously followed, and not exceeded

The South African student is recommended to use *The South African Group Intelligence Test*

Particulars of Test—This is "Published under the Auspices of the Federal Council of the South African Teachers Associations and procurable from the *Pro Ecclesia Drukkery, Stellenbosch* in four forms, two in English two in Afrikaans The tests cannot be given without the handbook of *Description and Directions* by Professor R W Wilcocks, this gives the *exact wording* and timing to be used by the tester as well as the 'weighting' for the sub-tests, the norms, etc The test is designed for children from 120 to 192 months old A booklet is required for each child The format is particularly good, and the plan of the

[1] *Mental and Scholastic Tests* p 9 [2] Op cit.

sub-tests so well set out as to be almost "foolproof," each sub-test being preceded by a preliminary demonstration exercise on a separate page A division is made into two parts, between which at least 15 minutes must elapse, which makes the total testing, with preliminaries, last from 1¼ to 1½ hours The children write in pencil, and a few spare pencils should be available to replace broken points

The test follows the lines of the Alpha, Otis and other well known group-tests There are seven sub-tests, viz Classification, Analogies, Number Completion, Story Completion, Letter Test (from a letter-series), Same Opposite, Figure Test (requiring blackboard explanations of plane figures) These are eductive throughout and "if equal weight be given to each test, the correlation between standard scores on the whole battery and *g*' is $r = 92$ (uncorrected for attenuation) The battery as a whole may thus be looked on as a good test of '*g*[1]

Preliminary practice must be gained, after studying the test, by alternating as E and S with a fellow student (using different forms), and by giving it to groups of two or three until the instructions are familiar, when it may be possible to obtain a group of children through the channels which operate for practice teaching arrangements As it is desirable to look at the testees when giving instructions, to see that they have turned to the right page, etc., it will be found a useful plan to insert the instructions in a booklet opposite the 'samples given, and to keep this annotated copy throughout, this avoids the intrusion of the handbook.

Actual Procedure—The manner should be friendly so that the children are put at ease, but the style must be brisk, clear and precise, if the children are accustomed to 'Ballard tests' in school they should be able to pass on to an 'examination footing which admits of no questions, without strain and with goodwill towards a stimulating experience. The plan of saving school time by herding as many as possible into the largest hall is a strain on both testees and tester, and is awkward when black board demonstration is required, ordinary classroom conditions are best. If double desks are used it may be found convenient to distribute the two forms alternately (not as a preventive to "cheating,' but as a convenience to testees), the pre

[1] *Jour of General Psychology* Vol. VI No. 2 April 1932. Article On the Distribution and Growth of Intelligence," by R. W Wilcocks

liminary exercises and instructions are almost identical, so that they can easily be used simultaneously A stop-watch is desirable, though a watch with a second-hand can be used

Correction and Results—Children should not correct their own tests, nor be told their results, unless in exceptional cases where the teacher may consider a pupil would be stimulated to work up to capacity poor results should not be told The quickest method of correcting is to make tracing paper stencils with indicative marks which coincide with the correct under lining, figures in places to match, etc , in this way the tests can very easily be checked mechanically

EXPERIMENT 3

POSITIVE AND NEGATIVE AFTER IMAGES

Aim—To note colour, shape, duration and recurrence of after-images

Material—Half inch squares of paper in well saturated colours red, green, blue, yellow A light (neutral) grey background such as the back of a book. A long pin or needle Stop-watch, or watch with second hand

Procedure—(This is best worked in pairs and must be so if the *duration* of images is to be noted)

S fixates a coloured square (in a good light which does not shine in his eyes), E timing him for 15 to 20 seconds, and then withdrawing paper with pin, while S continues to fixate the background, indicating whenever the image appears and disappears, by raising and lowering one finger accordingly E times duration of each appearance S describes colour, contour, brightness, and changes of images Several repetitions will be necessary to complete introspections

Results—Enter under

Stimulus	*Image* (Positive or Negative)	*Duration* (of each appearance)	*Description* Clearness (Intensity Determinateness)

(The S 's may express interest in the auras which surround the stimuli, which might lead to discussion on harmonious blends of colour in art The cinema furnishes good opportunities of observing positive and negative after images to bright stimuli when dark adaptation ' has set in)

N B—This and the next experiment are good examples of exercises which are necessarily purely introspective

EXPERIMENT 4

TYPES OF IMAGERY

Aim—To introspect imagery with a view to (1) comparing the relative strength in S of different types of imagery, and (2) noting the combinations in which S s images arise

Material—Paper and pencil Watch

Procedure—(This can be conducted satisfactorily as a class experiment, using either visual or auditory presentation or E s and S 's can work in pairs and alternate, or S can work alone using visual presentation, and exposing the words one by one.)

Instruct S to divide his page into three narrow columns on the left and one wide column (about half the page) on the right-hand side, and head thus

Type of Image	*Stimulus Word.*	*Quality of Image*	*Introspective Observations*

Instruct to fill in *type of image* and *word* as given *Quality* is to be recorded on five grades, which can if desired be computed quantitatively

Very Vivid—5 (Representing, as nearly as possible, perceptual vividness)

Vivid—4
Clear—3
Vague—2
Very Vague—1 (If impossible—0)

If the image is a *verbal one* (i e of the word instead of the object), this should be noted under quality

Under *introspective observations* should be noted affect, localization to any particular part of the body (as in cutaneous) incipient sense-organ adjustment, complication from other image-modalities than that required, general description of images

If the words are read out, E should allow 3 to 4 minutes for recording after each The first image impression to arise should be the one recorded E should give warning signals for each new type of imagery, and allow a slight pause between the types

Visual—A rose, home, breakfast table, a friend s face

Auditory—Train shunting, baby crying, fish frying, bugle

Cutaneous Tactual—Velvet, sandpaper, silk, blanket

Thermal—Ice, cold wind in face, heat of fire, heat of hot water in tank or tap

Pain—Pin prick, scratch of brambles or thorns, knock on shin or 'funny bone,' hair pulled

Gustatory—Chocolate, lemonade, salt, quinine

Olfactory—Freshly ground coffee, violets, onions, a seasonable fruit.

Kinæsthetic—Marching, dancing, waving arms in air, articulatory movements in cheering

Results and Introspections—The table as completed Computations of quality for each type on the scale given above

Conclusions—Any characteristics of S 's imaging which have been brought out.

References—*Introduction to Experimental Psychology* Valentine Experiment 1.A

Laboratory Guide Collins and Drever Experiment 2

Experimental Psychology Collins and Drever, pp 210-211

The foregoing experiment is in reality a composite use of Galton s Questionnaire method and Kraepelin's Word List method

EXPERIMENT 5

SPAN OF APPREHENSION

(S should not study directions beforehand)

Aim—(1) To determine the S 's span of apprehension for discrete material, and (2) to note the effect of grouping into wholes by meaning or symmetry

Material—A tachistoscope, paper and pen, set of cards as detailed below

Procedure—(This experiment is done ideally with one S at a time, S and E alternating (in which case a second series of cards must be drawn up), then S can sit fixating the shutter But it is possible for a group of S s to cluster round if they avoid foreshortened side-views)

E instructs S to watch the shutter and to jot down what he sees immediately it has passed E gives a warning signal each time The number of letters proceeds in steps, two of each number being shown, at any rate for the unrelated letters

	MQ	FN
	RZV	WBT
	GSPD	CQYH
	KNBXL	SGRVM
	BSFDPK	TZWHYC
	RAT	BUN
	BOOK	COME
	TABLE	FENCE
	PENCIL	FLOWER
(1 of each	GENERAL	PATIENCE
length)	SITUATION	SCHOOLROOM
	SPONTANEOUS	RELATIONSHIP
	MISCELLANEOUS	CONSTANTINOPLE
	THE DOG IS BIG	THE OLD MAN IS HERE



Fig 41(*a*)

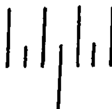


Fig 41(*b*)



Fig 42(*a*)



Fig 42(*b*)

One of the interesting by products of this experiment is the marked change of affect which attends the failure or success of cognition The change of tension in the S s when the transition

is made from the six letters to the word of three letters is generally observable by facial expression, respiratory changes, etc, and provides a good field for introspection)

References—*Experimental Psychology*, Collins and Drever pp 140-141, *Psychology and Pedagogy of Reading*, Huey, Ch IV, from which the above diagrams are taken

EXPERIMENT 6

ATTENTION DIVISION OF ATTENTION

Aim—To calculate and introspect capacity to carry on two simple operations at once

Material—Stop watch, paper and pencil

Procedure—(*a*) Let S articulate numbers, counting in threes e g 1, 4, 7, 10, etc, as fast as possible for 1 minute, noting down the last number

(*b*) Let him then write the letters of the alphabet from A to Z as many times as possible for 1 minute

(*c*) Let him combine both tasks for 1 minute, but without linking them rhythmically

Treatment of Results—The numbers of counts, and numbers of letters written for the three tests are added, and compared in every way possible Would it have been more profitable to have spent half a minute at each test separately?

S should note whether he ever actually embraced both tasks within the span of attention

For discussion, see Chapter XI

For Reference, see Valentine's *Introduction to Experimental Psychology* Experiment 7, from which this is taken with slight adaptation

EXPERIMENT 7

ATTENTION AND PERCEPTION

(*a*) *Concentration of mental energy*

(1) Statically

(2) Dynamically

(*b*) *Fluctation of perception* and influence of conative control

Aim—(*a*) To note (1) how many times mental energy wanders from an unchanging object and

(2) How it can be held by fresh eductive operations in which the same fundament occurs

Procedure.—(Students work in pairs, alternating as E. and S.)

(1) E holds some common object, such as pen or pencil, before S., who is instructed to keep his mind fixed upon it, *per se*, and without considerations, for 1 minute. He lifts a finger when his mind wanders from it, and lowers it when attention returns. E. records the number of fluctuations.

(2) The same is repeated, except that S. now educes as many relations as possible about colour, proportions, markings, etc., of the object. Fluctuations are generally lessened or reduced to zero.

Remarks.—This test really illustrates the Law of Span (i.e. the fact that every mind must keep its mental output constant), as well as the phenomenon of Oscillation. One item is not sufficient to occupy the span, and in any case cannot be held without oscillation and others must enter to fill up the vacuum (probably to an extent S. is unable wholly to introspect). In the second operation there is probably sufficient outlet for mental energy for the period.

See *Valentine* for discussion in other terms.

Aim.—(*b*) To note (1) the fluctuations in the perception of ambiguous figures when the mind is left free, and (2) their modification when deliberate effort is made to hold one aspect.

Material.—The ambiguous figures given on pages 214, 215, stop-watch.

Procedure.—E. and S. work in pairs, alternating as before.

(1) E. presents one figure at a time in isolation, S. indicates number and duration of fluctuations as he did in test on after-images. E. records.

(2) This is repeated, but E. now instructs S. which aspect he is to try to maintain. Deviations from it are noted as before.

This exercise gives valuable opportunity for introspecting the phases of perception discussed in Chapter XI. If possible some introspection should be given to the enhanced conation in (2).

EXPERIMENT 8

SENSORI MOTOR LEARNING BY THE TRIAL AND ERROR METHOD MIRROR DRAWING

Aim.—To demonstrate the Trial and Error Method of learning a simple sensori motor process.

Material—A mirror placed in a vertical position against a horizontal surface, screen to cover hand, pencil, drawing pins, watch with second hand or stop-watch, ten copies of star (these can be duplicated on a Gestetner or other duplicating machine, to last for several years, or a rubber stamp can be obtained and they can be stamped as required)

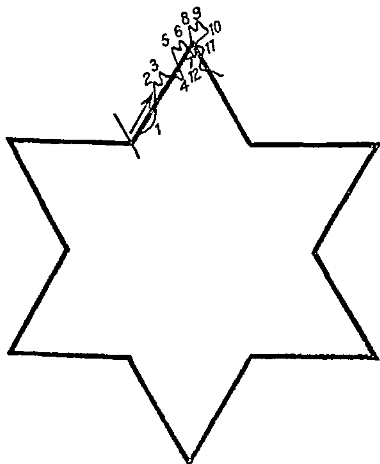


FIG 43—Specimen of how to count errors in mirror drawing

Procedure—(This can be taken as a class experiment if convenient and to save time each S can time himself, by noting the exact second he proposes to start each tracing beforehand and beginning as the watch hand reaches it It can also be worked in pairs with E and S alternating so that E can time) S pins each star (traced on square piece of

paper) about 2 to 3 inches from the mirror with the arrow pointing top right He looks directly in order to place his pencil upon the starting place on the cross line, after which he must shield his hand from direct view and look only in the mirror As each star is completed it should be numbered and the time of completion entered on it

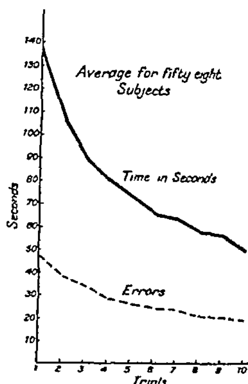


FIG 44—Curves for mirror drawing

S's instructions are 'Move in the direction of the arrow, not lifting your pencil point from the paper, and trying to keep it on the line of the star, as soon as you deviate from it try to return to the line immediately, do not run along off the line Work as quickly as you can, try not to reason out your procedure

Treatment of Results—Each attempt to return to the line counts as an error, this is rather a rough and ready way of calculating but if each S keeps the same standard throughout his

series, it works quite well Time and errors for each of the ten trials should be tabulated, and plotted graphically Averages may also be obtained for the group of S's This composite curve affords an interesting comparison with the erratic course of most individual curves Examples of both are given, and show that the experiment can give useful results, however simply undertaken

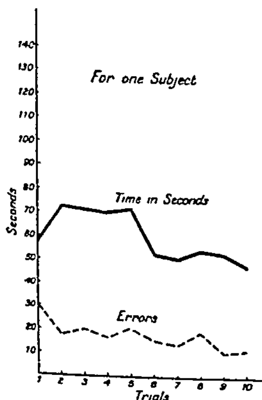


FIG 45—Curves for mirror drawing

REFERENCES AND SIGNIFICANCE OF TEST

Whipple, Pt. 2, Test 36, pp 119-132, gives an exhaustive account of variations of procedure and results obtained A useful variation, using two extra stars, is to trace the first and last stars with the left hand, and observe whether practice improvement has transferred from R. to L. hand.

Gopalaswami [1] has made a detailed analysis of the processes and errors involved in mirror-drawing, based on Spearman's principles The processes required are the application of the relation of inversion and the eduction from it of the right correlative movement, associative reproduction also plays its part in the general tendency to withdraw from a wrong position, and in the learning by experience during the trials In the above experiments S's were asked to proceed on the practical plane by so-called trial and-error, hence these processes will have been implicit rather than explicit, and the requirements will not have been clearly abstracted by S at the time

Gopalaswami classifies the wrong reactions into six types, which can be arranged in two levels, lower and higher On the *lower level* there are (1) reactions due to *habit*, i.e to the ordinary habit of direct hand and eye co-ordination, (2) *wild* errors which occur in phases of impatience or desperation, (3) moments of *inhibition* when the normal reaction is checked before another can be substituted, and (4) reactions of *withdrawal*, the habitual reaction upon perception of a wrong movement On the *higher level* are the errors which are based on the necessary intellectual process of *correlate finding* which is nevertheless unsuccessful because it either (5) misapplies the relation of inversion, or (6) having realized an error by eduction of relations misapplies the angular correction which is required

S should introspect the kinæsthetic effects does he end up with the impression of the 'feel' of an integrated star tracing movement?

Are any perseverating effects experienced? Instances have been known of S's who began to write up their notes mirror wise

S's early trials at the new co-ordinations may help him to sympathize with the child's first attempts at writing

EXPERIMENT 9

MENTAL WORK CURVE (OR FATIGUE CURVE, IF CARRIED FAR ENOUGH) CONTINUOUS ADDITION

Aim—To study the variations in the efficiency of mental work at different stages in a period of continuous mental work.

[1] "Intelligence in Motor Learning" M Gopalaswami *Brit Jour Psych* Vol. XIV Pt 3 Jan 1924

Material—Work sheets with digits in columns Stop-watch One minute time signal

Procedure—E explains and demonstrates how to add figures from the top downwards, beginning with left hand corner, and adding three at a time (The number can be decreased or increased if desired, too big a unit of work for a short time, however, gives results less sensitive to smaller fluctuations of efficiency, rest pauses provide a useful variation if a control group is used) The resulting unit figure is written in pencil on the right side of the last figure added, and the tens figure is dropped, the adding proceeds downwards one figure at a time, so that every digit has a result alongside except the first two in a column, no figures are carried from the bottom of one column to the top of the next, each column is begun afresh Thus

Given.	Pencilled Results.
5	
9	
6	0
8	3
3	7

E gives a signal (e g by tapping or ringing a bell) at the expiration of every minute (or half minute), and instructs S to draw a short horizontal line at the place he is at whenever he hears it

E arranges to give a double tap two minutes before the end and a treble tap for last minute

There should be a warning signal before the initial "Go

Treatment of Results—Compute the number of additions made in each minute, tabulate and graph Do the same for class results It is hardly worth while counting up errors for such a simple task.

Introspections are useful as showing how a process gets mechanized and whether methods of adding are changed in the course of the test Fatigue will probably be noted, from the eye strain especially

Results—Curves obtained should be examined for any of the characteristics noted in Chapter XIII Specimen curves for individual and composite average performances are given below Note, among other features the not un-

common drop after the initial spurt (seen also in the individual mirror-drawing curve on p 353), the greater

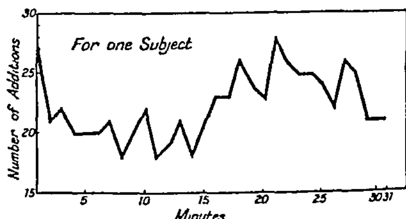


Fig 46 —Curves for continuous addition

amount of work done in the second half of the time, plateaux, the fatigue drop towards the end, the effect of

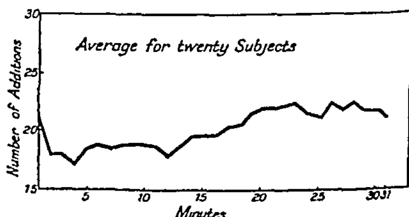


Fig 47 —Curves for continuous addition.

the end signal, arresting fall but not restoring improvement—at any rate of a sustained sort

Reckonıng Sheet

7	2	5	3	8	4	9	6	2	5	7	4	9	3	8	9	4	7	8	6	2	5	9	3
9	4	3	6	5	7	2	8	4	3	9	5	2	8	6	7	3	6	4	2	9	3	5	9
2	7	2	4	7	2	5	4	7	4	6	2	6	2	9	3	6	9	6	7	7	2	8	4
4	2	5	9	2	8	7	6	9	7	3	6	4	4	7	8	4	2	8	4	4	3	9	5
8	6	9	3	3	4	8	2	6	9	4	8	8	9	2	5	2	7	2	8	3	9	4	3
5	5	4	8	6	6	3	9	2	5	8	3	3	3	4	2	8	4	9	3	6	7	2	6
3	3	7	7	4	3	9	5	5	6	5	7	7	7	8	6	5	3	7	9	2	4	8	2
7	9	8	2	7	2	4	3	8	3	7	4	5	5	9	9	4	8	5	6	8	5	5	9
4	4	5	6	9	9	6	8	3	7	6	8	9	8	3	4	9	5	3	2	7	6	8	2
9	2	2	3	4	7	5	7	7	2	9	9	6	4	7	6	2	3	6	8	9	2	5	8
2	8	9	8	5	5	2	4	6	8	4	2	2	9	5	5	8	6	8	5	5	7	3	6
6	6	4	5	8	2	7	2	9	6	7	7	7	6	4	7	3	5	4	9	4	3	4	7
3	5	6	9	2	6	4	9	4	5	3	6	4	2	6	6	7	7	2	4	3	2	2	4
5	8	3	2	7	8	3	7	8	4	8	9	8	8	3	9	2	8	8	5	7	2	3	6
7	3	7	4	3	4	7	6	7	7	2	3	3	7	5	3	4	9	9	3	8	8	5	2
8	7	2	5	6	3	5	3	9	2	3	8	7	5	8	9	6	6	6	6	5	3	6	3
4	6	8	6	2	9	8	5	5	8	9	4	6	8	2	6	2	2	3	8	7	4	7	9
3	9	5	2	8	5	9	9	2	3	5	5	2	6	3	8	5	4	7	5	4	5	8	7
6	2	9	8	4	4	2	8	6	9	6	7	9	4	4	5	9	3	4	4	9	6	3	4
2	4	6	5	5	3	4	5	3	5	4	6	5	7	7	3	7	7	8	9	3	3	2	6
5	9	8	7	3	8	9	4	4	4	7	3	8	6	5	7	7	3	7	8	9	3	3	3
8	5	4	2	9	7	3	3	3	6	2	2	6	2	6	7	9	4	7	2	5	8	9	7
6	8	9	6	4	5	6	2	8	8	8	9	3	9	2	4	6	2	3	9	8	2	4	5
4	3	6	9	6	9	9	7	9	2	3	7	9	6	8	2	4	9	5	4	4	7	7	2
9	9	5	7	3	3	5	5	6	9	5	8	4	3	3	5	7	5	6	8	2	4	6	9
8	6	3	5	8	8	8	4	3	7	9	5	7	8	9	8	5	8	4	7	7	3	8	4
3	4	8	2	5	2	9	5	3	2	9	2	5	5	4	9	3	2	3	5	2	7	4	6
2	8	2	4	4	2	9	7	2	5	4	4	9	3	7	3	6	8	9	9	8	2	3	3
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9	7	6	3	9	7	3	2	4	2	7	2	7	4	3	6	5	2	5	9	8	3	4	8
5	6	7	9	6	4	8	6	3	8	5	7	3	2	8	2	2	7	3	5	4	9	3	4
7	5	4	2	8	9	5	8	6	4	2	3	6	7	2	4	6	5	9	6	2	3	6	7
6	8	4	7	5	4	3	9	6	8	5	4	5	4	9	4	2	7	7	7	9	6	5	6
3	3	3	7	3	8	6	4	5	3	4	8	8	3	7	5	7	9	8	4	6	9	8	7
9	9	7	6	6	6	7	2	8	7	9	4	2	9	3	3	3	5	2	3	3	4	3	2

EXPERIMENT 10

TRANSFER OF TRAINING CANCELLATION TEST

Aim—To find out whether any improvement is transferred from one cancellation operation (of parts of speech) to another (of separate letters)

Material—Watch Sheets of homogeneous prose (Special sheets of discrete letters can be obtained or duplicated for the first and last tests, ensuring the equal and irregularly arranged distribution of letters, but the experiment can be worked quite well throughout with sheets of printed matter from an old periodical or text book, not likely to distract by its subject matter, in which case pages presenting a homogeneous appearance, free from tabulations, etc should be selected)

Procedure—(This is a class or group test)

(*a*) All the S's cancel 3 or 4 given letters, e g R Y A I, for 3 minutes Their scores are then added (i.e. number of letters cancelled minus number of errors from omission or commission) S's are then divided into two, by the method of Equal Groups

(*b*) Group B then acts as Control, relaxes, or does something else at own pace

Group A practises crossing out adjectives and verbs from prose sheets for 20 minutes, or whatever time is convenient

(*c*) Test (*a*) is repeated by all for 3 minutes

Treatment of Results—The practice task does not need to be scored. Cancellations for the other two tests are added, and errors deducted

The percentage gain or loss in Test (*c*) compared with Test (*a*) is then calculated for both groups

Many variations can be introduced S's can be divided into more groups and given varied practice. The two tasks can be made more alike by confining both to letter cancellation, or both to cancellation of parts of speech The test can be worked also with the Reckoning Sheets, using vertical and horizontal addition, or addition and multiplication, etc

Most experimental text books give accounts Compare Starch's *Experiments in Educational Psychology*, Chapter XI

EXPERIMENT 11

MEMORY (1)

(*a*) Methods of Rote Learning
(*b*) Rote and Logical Learning

Aim—(*a*) To see whether subjects learn meaningless material best by visual, auditory, or mixed (visual, auditory and motor) methods

Material—At least 6 sets of 10 nonsense-syllables, 4 of which are printed on strips of paper Stop-watch

Procedure—The series should be presented in balanced order, e g

(1) Visual Mixed Auditory
(2) Auditory Mixed Visual.

The S 's are instructed to try not to articulate in visual and auditory learning If the experiment is conducted as a class one, the mixed method seems to suffer from the enforced pace necessary for simultaneous recitation. It is of course possible to mix motor and visual presentations without auditory, and let each S articulate quietly to himself In the visual learning S 's can be left to their own pace and retrace if they wish. In auditory, E should read at an even pace (about 1 a second) and should avoid rhythm Each learning is timed for 1 minute 20 seconds Sets of syllables have to be carefully drawn up to avoid immediate repetitions of vowels or consonants E is apt to fall into the snare of choosing syllables which have meaning in another and possibly known language, or form recognized abbreviations (sample set meb, vil, raz, gox, luf, kep, mig vof, rul, cak)

Results—The two results can be averaged for each method (Note more experience with nonsense-syllable learning would have to be undertaken, before S s learning of them would be stabilized enough to be used for any serious investigation of comparative methods of learning nonsense-syllables But this brief exercise serves to introduce the S s to the problem, and to the methods used.)

Aim—(*b*) To compare the above results with

(i) the memorizing of 20 associated words in a quarter of the time taken for 10 nonsense-syllables, viz. 20 seconds

(ii) the memorizing of a prose passage in the same time as taken for 10 nonsense-syllables, viz. 1 minute 20 seconds

Material—(i) List of 20 associated words (ii) prose passage standardized for marking Stop-watch

Procedure—(i) Instruct S's to listen carefully to the reading of 20 associated words and write down all they can remember immediately afterwards Some such series as the following should be drawn up to embody different types of association between the words book—page—court—king—jubilee—stamp—kick—horse—hospital—nurse—child—adult—adulterated—milk—cow—sow—bacon—breakfast—wedding—bride E should read clearly at the rate of one word a second

(ii) The prose passage should be read after the same instructions, S's being warned to reproduce the exact words if possible, but in any case to aim at recording all the ideas, however trivial E. should read at a moderate pace, timing himself to take 1 minute 20 seconds which may mean that he reads the opening of the passage a second time (if of same length as below)

The following passage is reproduced from Whipple[1] to give a model for the standardizing of marking

THE DUTCH HOMESTEAD

(180 words, 94 ideas)

' It was/ one/ of those spacious/ farm-/ houses,/ with high/ ridged,/ but lowly/ sloping/ roofs,/ built/ in the style/ handed/ down from/ the first/ Dutch/ settlers / the low/ projecting/ eaves/ forming a piazza/ along the front/ capable/ of being closed up/ in bad weather / Under this/ were hung/ flails,/ harness,/ various utensils/ of husbandry,/ and nets/ for fishing/ in the neighbouring/ river / Benches/ were built/ along the side/ for summer use / and a great/ spinning wheel/ at one end,/ and a churn/ at the other,/ showed/ the various/ uses/ to which this/ important/ porch/ might be devoted / From this piazza/ one might enter/ the hall,/ which formed/ the centre/ of the mansion/ and the usual/ place of residence / Here/ rows/ of resplendent/ pewter/ ranged/ on a long/ dresser/ dazzled/ his eyes / In one corner/ stood a huge/ bag/ of wool,/ ready/ to be spun ,/ in another/ a quantity/ of linsey woolsey,/ just/ from the loom ,/

[1] *Manual of Mental and Physical Tests* Pt. 2 p 210

ears/ of Indian/ corn/ and strings/ of dried/ apples/ and peaches/ hung/ in gay/ festoons/ along the walls,/ mingled/with the gaud/ of red/ peppers"

Results—Useful results for checking with each S's individual results are obtained if the scores of all the S's for Tests (*a*) and (*b*) are added and averaged Two sets of results can then be given—Individual, and Class-group

Subject.	Number Correct of					
	Nonsense Syllables in 1'20 each Series			Associated Words in 20"	Prose Passage in 1'20	
	Visual (10)	*Aud* (10)	*Mixed* (10)	(20)	*Words* (180)	*Ideas* (91)
Individual						
Class average						

Reference—Whipple, Test 39, for discussion of various aspects of Memory for Ideas

EXPERIMENT 12

MEMORY (2) WHOLE AND PART LEARNING

Aim—To compare the speed, efficacy and permanency of learning poetry by the Whole and the Part Methods

Material—Two passages of poetry of equal length from the same poem (e g Keats Hyperion"), copies for each S

Procedure—(*a*) Let one passage be learnt by the *Whole Method*, i.e by reading it through from beginning to end, trying to recite after each reading until S can repeat right through, S then notes time taken, and writes out from memory

(*b*) Let the second passage be learnt in sections, i e by repeating each two lines, or unit of meaning approximating to that length, and trying to recite between readings until known, and then passing on to the next passage, it may be read through once beforehand, and once again when the last couplet has been learnt S notes time taken and writes out as before

(c) The two passages should be written out again in a week's time, without intervening revision or attempts to reproduce

Results—Count words correct and in correct places for both reproductions

For discussion see Chapter XIV

EXPERIMENT 13

FIDELITY OF REPORT (OR AUSSAGE TEST)

(Instructions should not be read by S until after the experiment.)

Aim—To examine the conditions governing the reliability of evidence, (1) comparing the results of *narration* and *deposition* (i e evidence given in answer to cross-examination), and (2) testing the effect of suggestive questions

Material—Watch Picture selected by E (It would be useless to give any special picture for discussion here, as preliminary examination by S s would spoil the test)

Procedure—(This makes a suitable class experiment)

The *picture* chosen should be large and sufficiently definite for clear view by all It may be black and white or coloured, there should be a number of persons in it and it should demand some interpretation, but not a special knowledge unshared by all The Binet or Terman pictures do well if not already familiar

(i) S s should be instructed to attend carefully as only a brief exposure will be given The time allowed should depend somewhat upon the complexity of the picture, 20 to 40 seconds gives good results, effects of suggestion are more obvious when the exposure is brief

(ii) Instruct S s to record in writing all that they can remember, to smallest details

(iii) Let each underline every statement, the accuracy of which he would be prepared to attest in a court of law

(iv) Let E. put an interrogatory, S records each question briefly, and answers it in writing immediately, E. allows time before passing to next question

(v) S s attest statements by underlining as before

Note on Interrogatory—For adult subjects E. should draw up about thirty questions, these should cover all the main points of the picture The types of question should be

irregularly mixed, and contain some of all the six types recommended by Stern

1 *Determinative* questions, with no special suggestion e g "Who is the central figure in the picture?"

2 *Completely disjunctive* questions e g 'Is there a woman in the picture?" Here there are only two alternatives, yes or no

3 *Incompletely disjunctive* questions e g Is the central figure a man or a woman?' Independence is required for the rejection of both and choice of a third

4 *Expectative* questions Was there not a child in the picture?" This is moderately suggestive, the answer Yes' is indicated as expected

5 *Implicative* questions when the presence of a feature not actually there is assumed or implied e.g 'How big is the child?' This is strongly suggestive

6 *Consecutive* questions, building on previous suggestions e g "Does the child look sad or happy?

Treatment of Results—The statements in the Narration (N) and Deposition (D) are checked and calculated for both N and D as follows Let

n	stand for the number of points given,				
$n(r)$	"	"	"	"	" rightly,
c	"	"	"	"	" certified,
$c(r)$	"	"	"	"	" and right

Tabulate results

E. needs to give careful guidance about estimation of points in the narration

Results—*Whipple* and *Stern* have much to say about the results of this test which have been used for extensive investigations on the reliability of witness In general

(1) Narration is more reliable than Deposition, or Cross examining with leading questions, in Narration the S records only what he actually noticed, but he is questioned on other points also

(2) More points are usually attested in Narration

(3) More attested points are correct in Narration

(4) Individuals differ considerably in their suggestibility in such a test The writer has had answers from S s agreeing to non-existent church towers, and to a dog chasing sheep when neither dog nor sheep were in the picture

(Incidentally there was some discussion on the moral aspect of the non veracious implications)

(5) Attestation does not guarantee accuracy, though there are about half as many errors in sworn testimony as in unsworn

(6) Children are found to be less reliable than adults, but more confident and ready to attest their views

(7) Stern notes the better results obtained from concentrated study during brief exposure of a picture, than from report on a picture that has long hung on the walls of a room habitually occupied

EXPERIMENT 14

THE FORMATION OF CONCEPTS

Aim—To introspect the processes involved in concept formation (viz disjunction, confusion and free eduction), and to note the characteristics of the concepts when formed

Material—Five or six sets of picture postcards, with five or six in each set, according to number of S s There should be one for each S, and five or six over Stop-watch

Procedure—This is a very suitable subject for a group experiment

(1) Divide the picture postcards into some such classes as the following, labelling each clearly on the back

Sanop—Snow scenes

Dranel—Methods of transport

Bouwel—Interiors of sacred buildings

Shushak—Pictures with buildings (ancient, modern, cottage, cathedral, etc.)

Houdier—Pet animals

Trekmet—Geometric designs

Some overlap between the scenes in the pictures improves the test, e g animals may appear in Dranel as well as in Houdier, snow in Dranel or Shushak, etc.

(2) Instruct S s that there are classes of pictures, each of which has a name given to it, which must be learnt as the class is understood.

(3) When the cards have been well shuffled, lay one before each S face upwards Instruct carefully how rows are to pass cards along, E keeps transferring cards from the last S to the first, seeing that the order remains undisturbed At a signal S s turn cards to see name, examine, and after 15

seconds pass cards on at the words, stop pass and repeat until each S ha seen every card in turn Let S s stop with the original cards before them and cover them Instruct S s to write down

(4) The meaning of each class as its name is read out

(5) Introspections of what each name signifies to them over and above the definition of common character—any imagery involved, etc.

(6) Introspections of the processes by which they became aware of this class, any mistake made initially and subsequently corrected, etc

(7) Repeat 3, 4, 5, and 6 without giving any information about correctness This time, however, 10 seconds will be sufficient for each exposure

Let the S's consider whether their introspections bear out the account of concept formation given in Chapter XV

References—*Introduction to Experimental Psychology* Valentine Experiment 33 upon which the experiment is practically based

Spearman *Nature of Intelligence* Chapter XVI, for theoretical interpretation

APPENDICES

APPENDIX I

TWO HISTORIC SCHOOLS—FACULTY PSYCHOLOGY ASSOCIATIONISM

In order to give a clear presentation of the present schools of psychology it is necessary to make a brief reference to the schools which are their immediate precursors

The reaction of the twentieth century has been indebted yet opposed to two scientifically obsolete and mutually interwoven theories which are still well represented on the shelves of some of our public and institutional libraries and are not more than obsolescent in many educational circles namely 1 *Faculty Psychology* 2 *Association Psychology*

1 *Faculty Psychology*[1] can be traced back to Plato and Aristotle It is an attempt to explain experience by tracing it to a few main functions of the mind " or soul Thus Plato made a dual division into Sense and Intellect soon Memory was added and then Imagination or Invention Speech Attention and Movement received intermittent recognition. It was also customary to sub-divide Intellect into the three powers of conception, judgement and reasoning. This theory held considerable sway in the eighteenth century, and endeavoured in the early nineteenth century to give itself a pseudo-scientific background by an alliance with phrenology which claimed to locate the seat of each faculty in a corresponding area of the brain.

The theory has long been exploded philosophically and scientifically While it did some service in descriptive classification it mistook classification for explanation and was found to be arguing in a circle thus an act of reasoning could only be " explained as having its source in a Faculty of Reason

Yet one of the strangest anomalies in the history of education is the extraordinary persistence with which this doctrine has influenced thought and practice On it has been based the whole superstructure of *formal training* that is the teaching of subjects (for example the classics) merely for the *mental discipline* which they afford

2 *Association Psychology*[2] also had its origin in ancient philosophy

[1] Cf *Nature of Intelligence* Spearman, Ch. III

[2] See *Outline of Psychology* McDougall Ch. I, *Principles of Psychology* James, Vol I Ch XIV *Psychologies of 1930*, ed. Murchison Ch. II *Associationism and "Act" Psychology A Historical Retrospect* G S Brett.

But its heyday of activity came in the eighteenth and early nineteenth centuries with such men as Hobbes Hume and Hartley It was a revolt against the descriptive, structural Faculty psychology and sought to enter the realm of scientific explanation Accordingly it put forward a single formula and fell into the snare of over simplification. It maintained that consciousness could be analysed into its elementary units or sensory compounds a sensation once aroused was said to draw round itself a cluster of revived sensations or images and to develop into an *idea* thought processes thus consisted of the revivals of these "ideas" in sequences and formations determined by past *associations* The types of associations were variously enumerated generally as four, viz. *Similarity Contiguity* (in time or place) *Cause*, and *Effect* Sometimes, however the attempt was made to reduce all forms to one type viz. *Association by Contiguity* or *Habit* Thus James [1] writes The several 'faculties of the mind were dispossessed the one principle of association between ideas did all their work. As Priestley says Not only all our intellectual pleasures and pains but all the phenomena of memory imagination volition reasoning and every other mental affection and operation, are but different modes or cases of the association of ideas

As neural physiology began to develop, following on Descartes discovery in the seventeenth century of the mechanism of the reflex arc (though he postulated a fluid passing along the nerves) so the attempt was made to relate this psychology more and more closely with the physiological explanations in terms of nerve-cells in which ideas were loosely spoken of as stored. To rid associationism of this mosaic effect of a composition of atoms, J S Mill stressed the effects of fusion and postulated that the components no longer retained their own character but somehow generated a new mental product, a doctrine which has been described as mental chemistry Thus *a* would not merely revive the chain *b*, *c*, *d* *e*, but would generate a new compound of these, namely, *x*.

As late as 1898 James though he criticized the theory of the chain-revival of atomistic sensations, yet allowed himself the admission that few principles of analysis, in any science have proved more fertile than this one

The direct influence of this doctrine upon educational practice is largely due to *Herbart* who developed from it in Germany his doctrine of the *apperception mass* which stressed the importance of relevant connexions for the right assimilation of new ideas by the material already in the mind. For more than half a century pedagogy bowed to his *Five Formal Steps* with their careful arousal of the right associations in the Preparation, and the often laboured Association step which ran parallel with the Presentation

Associationism has not relaxed its hold without leaving an interesting progeny behind it. As Professor G S Brett [2] has pointed out on the one hand there arose the train of association experiments in the cognitive

[1] *Principles* Vol. I p 597 [2] *Psychologies of 1930*, Ch. II

field, culminating in Ebbinghaus introduction of nonsense syllables for testing the processes by which associations could be established with (theoretically) uniform material.

Along another line but shorn of the old concept of ideas has been the study of the association of muscular sequences resulting in skill which has been the special field of *behaviourism* One of its triumphs was Pavlov s discovery of the conditioned reflex which carried the investigation into the very " recesses of the physiological mechanism

Finally, there has been a further heritage in the field of abnormal psychology and in criminal investigation Lists of words have been standardized which require the subject to reply with the first word which occurs to him, any delay for substitution or inhibition shows itself in the lengthened reaction time, which Jung in particular has used for the indication of complexes and juristic psychologists have experimented with for the detection of crime (e g knife-fork forms a normal sequence, delay would suggest that a more vivid association had arisen and been suppressed) This is the well known method of *Word Association.*

APPENDIX II

A

THEORIES OF THE RELATION OF BODY AND MIND

The following bald statements and diagrams are set out without comment in order that the present-day student who is often singularly lacking in any kind of philosophical background or interest may at least know that these views have occupied men's minds and still do occupy them and so perhaps be encouraged to read a little philosophy for himself, and to make some first essays at synthetizing his own scheme of knowledge or at least to feel the need for striving towards some coherence.

1 *Epiphenomenalism*

The physical brain processes are here regarded as the causal reality, consciousness is given off from them without influencing them it is an epiphenomenon thrown off like the shadows cast by the moving parts of a machine [1] or like the steam whistle or the creaking of the wheels

The simplest form of diagram may represent it thus



Fig 48

or more correctly, as illustrating the causal nexus of the material processes

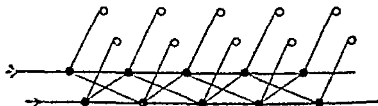


Fig 49

[1] *Body and Mind* McDougall p 128

N B—In all these diagrams physical processes of the brain are indicated by the black discs below the circles above stand for elements of the stream of consciousness causal links are indicated by the lines and the time direction by the arrow heads [1]

2 *Psycho-physical Parallelism*

Physical and psychical processes are regarded as two equally real series of events The psychical processes of the mind and the physical processes of the brain run parallel and accompany one another in time There are causal links within each series but not across from one series to the other, that is to say, there is no *interaction*

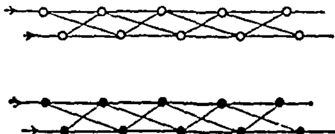


FIG 50—The circles should be regarded as lying in a different plane from the dots both at right angles to the page.

There are two forms of this doctrine, viz. *restricted* and *universal* parallelism The former regards the psychical concomitants as applying only to *brain processes* the latter regards them as accompanying *all physical processes* organic or inorganic alike

Some thinkers, wishing to escape from this *dualistic* idea of two realities have sought to relate or identify the two and so achieve a *monistic* philosophy, in either of the two following ways

3 *Phenomenalistic Parallelism*

This postulates an unknown reality underlying both the physical and the psychical appearances which represent two aspects of it like two shadows of the same substance

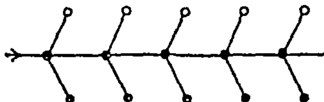


FIG 51

[1] Op cit p 18

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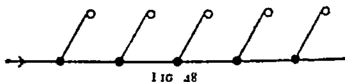


Fig 48

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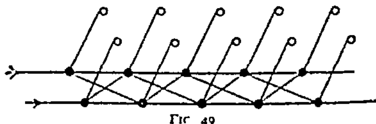


Fig 49

[1] *Body and Mind* McDougall, p 128

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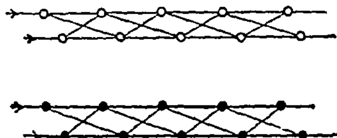


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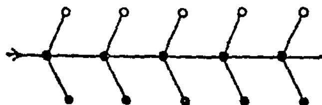


Fig 51

[1] Op cit p 1.8

4 *Psychical Monism* (i)

The causal efficiency is regarded as belonging only to the psychical series physical matter and its processes being like the shadows thrown by thought It is the converse of Epiphenomenalism



Fig 52

This doctrine must be distinguished from

5 *Psychical Monism* (ii) *or Solipsism*

The above doctrine maintains the objective existence of the physical world and of other minds although it regards them all as of the nature of consciousness Solipsism on the other hand denies any reality outside the subject's own thought, the physical world and other minds are regarded as existing only as ideas of the subject's mind It admits of no causal links and may be represented thus the objective being wholly absorbed in the subjective



Fig 53

6 *Psycho-physical Interaction*

This doctrine postulates a mutual interaction of psychical and physical elements working in a network of cause and effect. Difficult as it may be to conceive of any interruption in the physical sequence of the

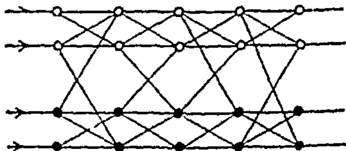


Fig 54

brain processes from factors of a wholly other psychical sort "we may nevertheless believe [1] McDougall writes that, even if all the physical

[1] *Body and Mind*, p 228

and chemical processes of the brain were perceptible by the physiologists as movements of particles, there might occur certain deflections of the moving particles, or certain accelerations or restraints which would remain inexplicable and unpredictable by mechanical principles'

B

SOME PROBLEMS IN THE RECONCILIATION OF PSYCHOLOGY AND RELIGION

It is proposed to state here as clearly as possible some of the divergences which have made themselves apparent between the new psychological interpretations of life and the traditional religious and spiritual explanations and at the same time to indicate where possible the bridges whereby advancing thought and knowledge appear to be spanning the gulf in sundry, often unexpected quarters

1 *The Divergence of Behaviourism* is a very obvious one It rests upon a crude form of materialism which would appear to deny ignore or reduce to physical terms even the epiphenomenal existence of consciousness Following the line of the former diagrams it may be represented thus [1]



FIG 55

This mechanistic view of physical cause and effect (which of course precludes belief in any form of survival after death) is one to which physical scientists and perhaps physiologists in particular were especially prone at the end of the last century and in the first decade of this The present trend of physical science however seems to be leading away from confidence in a neatly explicable closed physical system Einstein s Theory of Relativity Jeans astronomical expositions and a general tendency towards more synthetic interpretations such as the Gestalt school has advanced in psychological quarters seem to be possible factors in dissolving a confident atheism into at least a humbler agnosticism. A no less eminent physiologist than Sir Charles Sherrington has recently voiced the following recognition of scientific limitation "But indeed what right have we to conjoin mental experience with physiological? No scientific right. To many of us a mere juxta position of the two sets of happenings proclaims their disparity As for me what little I know of the one does not speaking personally even begin to help me toward the how of the other We admit that the physico-chemical to which we here seek to correlate the mental experience is for us itself at long last mental a thought an idea But strictly we have to regard

[1] Op cit. p 134

the relation of mind to brain as still not merely unsolved but still devoid of a basis for its very beginning [1]

2 *The Divergence of Psycho-Analytic and Allied Schools* is more subtle and has more ramifications its tenets appear in a mystical and romantic light instead of in the crude daylight on which behaviourism prides itself The main mechanisms by which they attempt to account for religious experience may be summed up as follows

a Projection.
b Regression.
c Sexual libido
d. Suggestion especially auto-suggestion.
e The Œdipus Complex whence springs the Ego Ideal.

These will be considered in turn

a Projection

Freud states, As a matter of fact I believe that a large proportion of the mythological conception of the world which reaches far into the most modern religions is nothing but Psychology projected into the outer world" [2] And Jung adding the additional weight of his "Collective Unconscious" writes Who is this God? He is a thought which humanity in every part of the world and in all ages has brought forth from itself and always in similar forms. The Deity is nothing but a projected complex of the representation of the sum of the libido [3] God is a function of the Unconscious" [4] Freud links the idea of projection closely with that of

b Regression to the Father fixation, thus he claims that psycho-analysis has 'traced the origin of religion to the helplessness of childhood and its content to the persistence of the wishes and needs of childhood into maturity [5] and objects that adults must not persist in remaining "in the nursery [5]

It is necessary to analyse the concept of *projection*. Dr Hywel Hughes[6] says of it "We note that there are two kinds: One a perfectly legitimate operation of man s reason and the source of all progress in knowledge the other an activity of the unconscious self springing from the repressed

[1] *The Brain and its Mechanism* Sir Chas Sherrington Rede Lecture, 1933 pp 22 23 -4 32
[2] *Psychopathology of Everyday Life* Freud p 310
[3] *The Psychology of the Unconscious* Jung Ch. I
[4] *Psychological Types* Jung p 315 This and the two above extracts are quoted in *The New Psychology and Religious Experience* by T H. Hughes pp 95 96
[5] *New Introductory Lectures on Psycho-analysis* Freud, p. 214
The New Psychology and Religious Experience T H Hughes p 102

emotions that exist as complexes in the unconscious realm The former type of projection he describes as a leaping out of the human consciousness to grasp a fact that is real in the world [1] In other words *projection is but another name for correlate eduction* Spearman has made it plain that transcendental knowledge can only come to us by way of the eduction of correlates—through the leaping out from one fundament by means of a relation to grasp another fundament hence we conceive *infinity* as the opposite of *finiteness* *immortality* as the opposite of *mortality*, though they transcend our experience But if our first fundament is faulty or untrue the correlate educed will likewise be invalid although the process itself has been valid enough Thus if a poor woman imagines herself to be Cleopatra she educes rightly that homage may be expected from attendants though neither the original nor the educed fundaments can stand the objective tests Both Freud and Jung are fond of comparing the projection of the idea of God with the delusions of the paranoic. This is to deny the possibility of valid knowledge of reality, and to enmesh us in the toils of solipsism. As Dr Hughes goes on to say Let us admit at once that the idea of God is a projection for in no other way could we have an idea of Him The mistake those men make is to contend that because the idea is projected there is no Divine Being that corresponds to it and that because it is born in man s experience it is an illusion and has no reality By the same process of reasoning we might argue that the Universe itself with its laws and processes which science with increasing conclusiveness is proving to be real are yet not real but are only appearances and illusions [2]

What then are the criteria which may be said to differentiate valid eduction from delusion? They are the usual checks and proofs which come from (1) coherence and congruity with other known facts, (2) and with the experience of others (3) the pragmatic test of usefulness in explaining the world (4) the test of reason There are also considerations to be drawn from the psychology of the subject (5) Is his mental health normal? how does it function in other departments of life? does he possess complexes which would be likely to produce rationalizations in this and other directions? (6) What have been the views and experience of the highest and most effective personalities in history? Here the emphasis laid by Christ on the Fatherhood of God must be taken into account.[3] (7) Finally what is the result of analysis upon such a belief? does it confirm or dissipate it? Dr William Brown answers the last question as follows According to one s experiences of the pathological processes of projection and regression and the influence of the Œdipus complex in a patient these are usually diminished or eliminated by a course of psycho-analysis If therefore the typical religious attitude towards life is explicable in these terms the religious

[1] Op cit p 105 [2] Op cit p 102

[3] A point well treated by Dr Cyril Valentine in *Modern Psychology and the Validity of Christian Experience* Ch. II

consciousness would be altered by analysis in the direction of elimination One would expect according to this theory that deep analysis would leave the patient less religious than he was before, my own experience has been the exact opposite of this After an analysis (for scientific purposes) by a leading psycho-analyst extending over ninety two hours my religious convictions were stronger than before not weaker [1]

Let it then be admitted that the *idea of God* is a projection in the sense of a correlate-eduction and as such may be subjected to all available tests until these tests have been proved to fail conclusively there can be no justification for denying the *reality of God* To quote T H Hughes again What these men do is to confuse the reality of God with the idea of God and then, since the Idea of God is a projection of the mind and indeed must be so they regard God Himself as nothing more than this projection of Him. [2]

c Sexual Explanation of Religion

It is commonly alleged that Freud and his followers regard the religious attraction as a libidinal one Freud [3] explains the Christian Church as bound together by a libidinal attachment to Christ which creates a similar attachment among its fellow members Moreover a good deal has been said on all sides about adolescent conversion and the erotic language of devotion William James answer given in a footnote in his famous *Varieties of Religious Experience* probably still remains the best answer to this challenge As with many ideas that float in the air of one s time this notion shrinks from dogmatic general statement and expresses itself only partially and by innuendo It seems to me that few conceptions are less instructive than this re interpretation of religion as perverted sexuality It is true that in the vast collection of religious phenomena some are undisguisedly amatory But then why not equally call religion an aberration of the digestive function. ? Religious language clothes itself in such poor symbols as our life affords and the whole organism gives overtones of comment whenever the mind

[1] *Science Religion and Reality*, ed. Needham 1925 Essay "Religion and Psychology W Brown p 311 Also *Mind and Personality* p _68

[2] *The New Psychology and Religious Experience* T Hughes, p 112

[3] *Group Psychology and the Analysis of the Ego* Freud trans James Strachey 1922 *Two Artificial Groups The Church and the Army* pp 44 45 "It is to be noticed that in these two artificial groups each individual is bound by libidinal ties—on the one hand to the leader (Christ the Commander in-chief) and on the other to the other members of the Group Translator's note "The German *libidinös* is used simply as an adjectival derivative from the technical term *libido* *libidinal* is accordingly introduced in the translation in order to avoid the highly-coloured connotation of the English *libidinous*."

is strongly stirred to expression Language drawn from eating and drinking is probably as common in religious literature as is language drawn from the sexual life We hunger and thirst after righteousness etc

In fact one might almost as well interpret religion as a perversion of the respiratory function The Bible is full of the language of respiratory oppression Hide not thine ear at my breathing my groaning is not hid from thee etc [1]

In answer to the charge that conversion is a synchronous adolescent phenomenon he continues Even were the asserted synchrony unrestrictedly true as a fact (which it is not) it is not only the sexual life but the entire higher mental life which awakens during adolescence One might then as well set up the thesis that the interest in mechanics physics, chemistry logic, philosophy, and sociology which springs up during adolescent years along with that in poetry and religion is also a perversion of the sexual instinct but that would be too absurd Moreover if the argument from synchrony is to decide what is to be done with the fact that the religious age *par excellence* would seem to be old age when the uproar of the sexual life is past?

The plain truth is that to interpret religion one must in the end look at the immediate content of the religious consciousness The moment one does this one sees how wholly disconnected it is in the main from the content of the sexual consciousness Everything about the two things differs objects moods faculties concerned and acts impelled to Any *general* assimilation is simply impossible what we find most often is complete hostility and contrast. If now the defenders of the sex theory say that this makes no difference to their thesis that without the chemical contributions which the sex organs make to the blood the brain would not be nourished to carry on religious activities this final proposition may be true or not true but at any rate it has become profoundly uninstructive we can deduce no consequences from it which help us to interpret religious meaning or value In this sense the religious life depends just as much upon the spleen the pancreas and the kidneys as on the sexual apparatus and the whole theory has lost its point in evaporating into a vague general assertion of the dependence *somehow* of the mind upon the body"

Translated into terms of instinct psychology where the instincts are regarded as reservoirs of energy with maybe a common reservoir in the last resort or at any rate some reciprocal drainage this last point may be summed up in T H Hughes words The fact is that all the instinctive nature of man is operative in religion It calls out and lays its tribute on every power and every impulse that human nature possesses It is the reaction of the total personality to its environment and in that environment as far as religion is concerned God or some such being or beings is the most prominent feature [2] The peculiar danger of excitation and confusion of sex emotion in religious devotion has of course

[1] *The Varieties of Religious Experience* Wm James 1902 pp 11 12

[2] *The New Psychology and Religious Experience*, Hughes p 125

in authority the power of their injunctions and prohibitions remains vested in the ego-ideal and continues, in the form of conscience to exercise the censorship of morals The tension between the demands of conscience and the actual attainments of the ego is experienced as a sense of guilt. ' (P 49)

Thus "conscience, innate and acquired once more makes its appearance (It looks also as though moralists may welcome back *will* from another quarter the members of the London school are claiming the existence of a *W* factor "taken provisionally to represent *will* or consistency of action ")

3 Both psycho-analytical and other schools of psychology have concerned themselves with the *analysis of religious intuition.* The fundamental issue between religious believers and non-believers must always be whether or not God exists and this obviously lies outside the sphere of psychology, and its answer must rest upon other grounds Christianity itself claims a historical basis attested by documentary evidence Yet there seems to be an idea that if all the so-called religious states could be "explained" psychologically no place would be left for belief in a supernatural agency This is pre-eminently the conclusion of solipsism which believes that all knowledge " is generated by the subject s own mentality and has therefore no other existence *in reality* If this doctrine is sometimes applied to such experience as comes through the sensory channels it is not surprising that it should be applied even more widely to that which claims to rest upon an intuitional basis

It must be granted that although religious belief may claim to rest upon quite other inferential bases it is of its essence that the believer should claim also the possibility of supernatural communication through intuitional (in the meaning of non-sensory) channels if not for himself at first hand at any rate for the leaders—the prophets and the priests—of his faith. This then has seemed the most vulnerable point for psychological analysis and a fair field presented itself in the accessories of mysticism the visions (sensible or imaginary) interior words physical ecstasy clairvoyance and so forth which could all be summed up as "pathological experiences

Yet it is noteworthy that theologians have never regarded such experiences as of any essential value *in themselves* and the following comments on visions are typical of the attitude of the ecclesiastical authorities towards them: Considering them from outside by their experimental characteristics alone they might be attributed *indifferently* either to supernatural action or to the simple play of the hallucinatory mechanism For from the phenomenal point of view they present no specifically mystical element no element which *of itself* transcends ordinary psychology In order to attribute a religious value to them we are compelled in consequence to seek for indications outside the

The Ego and the Id Freud 1923 (London 1927), pp 47-49

realm of psychology All the more so inasmuch as the role of experimental psychology is to disclose the laws of connexion of mental phenomena but not to discover the ontological[1] causes of those phenomena.[2] The religious value of such phenomena will be checked by the considerations already dealt with under *projection* as applied in the sphere of religion

When Bernard Shaw psychologizes the visions of Joan of Arc by seeking to explain the antecedents of the particular images of her projections he is actually leaving the religious significance and validity of her visions untouched

[1] ' Concerned with the essence of things or being in the abstract hence belonging to philosophy

[2] *Studies in the Psychology of the Mystics* Marechal 1927 p 110

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